DOCUMENT RESUME

ED 338 478 SE 051 991

TITLE	Wet and Wild Water.
INSTITUTION	Indiana State Dept. of Education, Indianapolis. Center for School Improvement and Performance.
REPORT NO	TAC-B-118
PUB DATE	90
NOTE	228p.
PUB TYPE	Guides - Classroom Use - Teaching Guides (For Teacher) (052)
EDRS PRICE	MF01/PC10 Plus Postage.
DESCRIPTORS	Elementary Education; *Environmental Education; *Interdisciplinary Approach; Language Arts; *Learning Activities; Mathematics Education; Science Education; Social Studies; Thematic Approach; *Water; Weather

ABSTRACT

This guide uses a thematic approach to show the integration of subjects (reading, mathematics, language arts, science/fine arts) and skills to create a context for learning. The contents of this guide are presented in a holistic format. There are six major topics in the guide, each with subtopics: (1) "Getting Your Feet Wet--An Introduction to Water"; (2) "Fishy Business--Applying Economics"; (3) "The Big Splash--Water Sports, Athletes, and Water Animals"; (4) "Where in the World--Famous Explorers of the Past"; (5) "Water Mysteries--Myths, Legends, and Strange Occurrences" (Loch Ness Monster and Atlantis); and (6) "Join Hands for Tomorrow's Water--Global Responsibility." Each topic is divided into different subtopics and each topic includes: (1) a divider page showing topics and subtopics; (2) core knowledge--the base level of information that the teacher will draw upon to use in direct instruction to the students; (3) activity--including objectives which relate to subject areas, materials needed for the lesson, directions for the activities; (4) water experiments; and (5) lists of books and resources for the teacher. (CW)

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WET AND WILD WATER

Indiana Department of Education
Center for School Improvement and Performance
Office of School Assistance
Room 229 State House
Indianapolis, Indiana 46204-2798
(317) 232-9141

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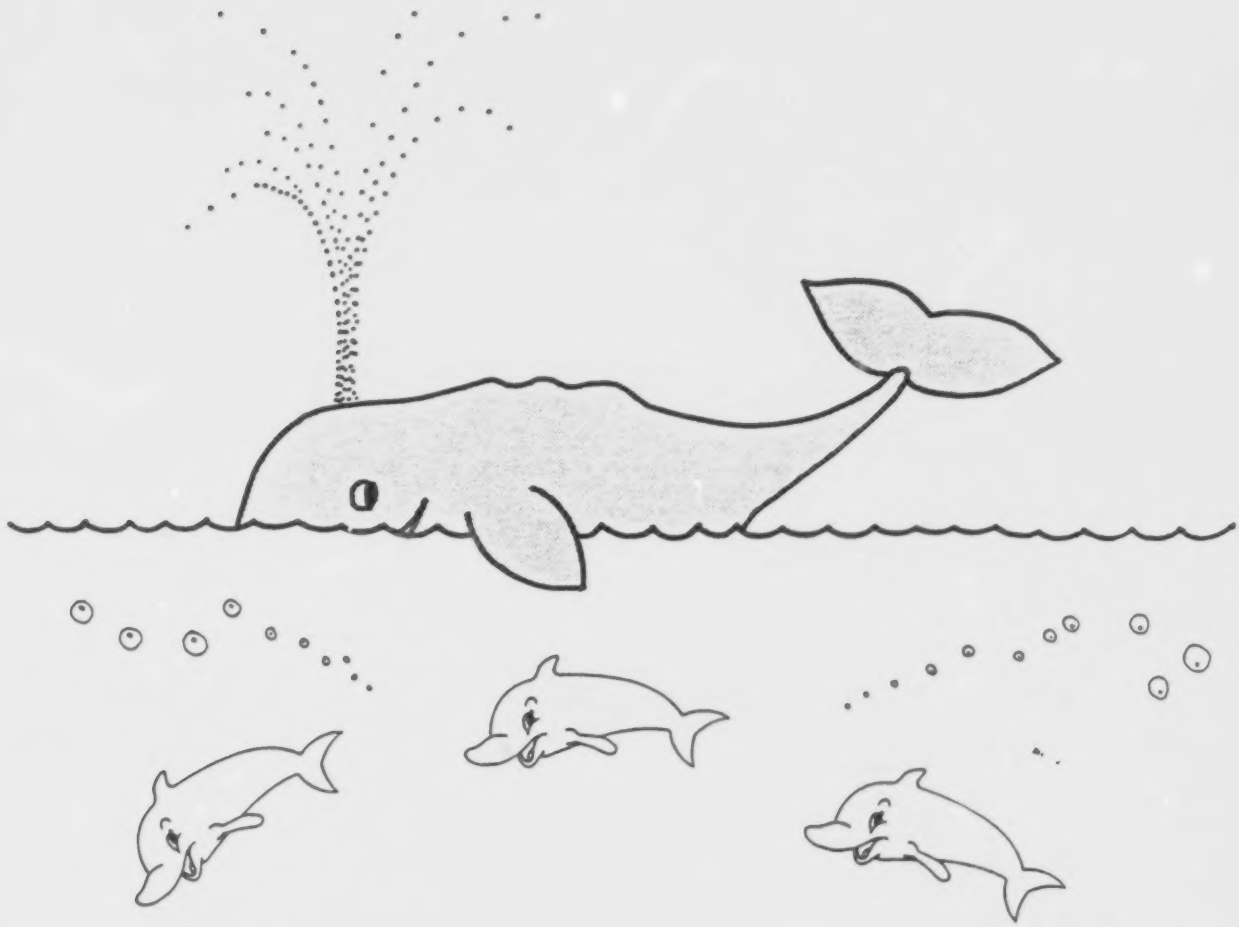
INTRODUCTION

Welcome to a WOW curriculum for an investigation of the Wonders of Water!

This guide, WET AND WILD WATER, shows the integration of subjects and skills and creates the context for learning. It provides a structure around which the mind can organize information into meaningful wholes.

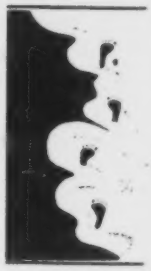
You will notice the contents of this guide are presented in a holistic format. Since interest is the key to learning, we encourage you to select materials and activities geared to the interest and ability level of your students. This will allow your class to become a community of learners where each person takes ownership of the learning process.



WET AND WILD WATER

TOPIC I

GETTING YOUR FEET WET
An Introduction to Water



Subtopics
1. Water
2. First Day

TOPIC II

FISHY BUSINESS*
Applying Economics

Subtopics
1. Aquariums
2. Organizing the Business

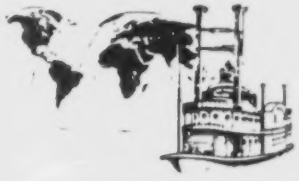
TOPIC III

THE BIG SPLASH
Water Sports, Athletes, and Water Animals

Subtopics
1. Swimming
2. Fishing

TOPIC IV

WHERE IN THE WORLD?
Famous Explorers of the Past



Subtopics
1. Magellan/Oceans
2. LaSalle/Mississippi River

TOPIC V

WATER MYSTERIES
Myths, Legends, and Strange Occurrances

Subtopics
1. Loch Ness Monster
2. Atlantis

TOPIC VI

JOIN HANDS FOR TOMORROW'S WATER
Global Responsibility

Subtopics
1. Tropical Rainforest
2. Water Management

*This could be an ongoing activity throughout the study of water. You may want to work this in with "Getting Your Feet Wet."

How to Use WET AND WILD WATER

The theme, WET AND WILD WATER, has six topics. Each topic has different subtopics. For example:

THE BIG SPLASH
Water Sports, Athletes, and Water Animals
1. Swimming
2. Fishing

Please read this introduction before you begin. Each topic with subtopics is explained separately in this book. Each topic can stand alone, or you can interchange the topics. REMEMBER, YOU DO NOT NEED TO TEACH EVERYTHING IN THIS GUIDE.

Example: Teacher A may decide to dive right into THE BIG SPLASH and, then, swim to WHERE IN THE WORLD . . .? while - Teacher B may decide to jump into WATER MYSTERIES and, then, reel into FISHY BUSINESS.

Each teacher has the option of selecting certain topics and choosing how many subtopics to teach.

Each topic will include:

1. Divider page showing topic and subtopics.

2. Core Knowledge - the base level of information that the teacher will draw upon to use in direct instruction to the students. You will select from this material what you want the students to know at the end of the study. We have included some basic facts, but we encourage you and your students to gather more information to expand the Core Knowledge.

3. Activity - Each activity will include:

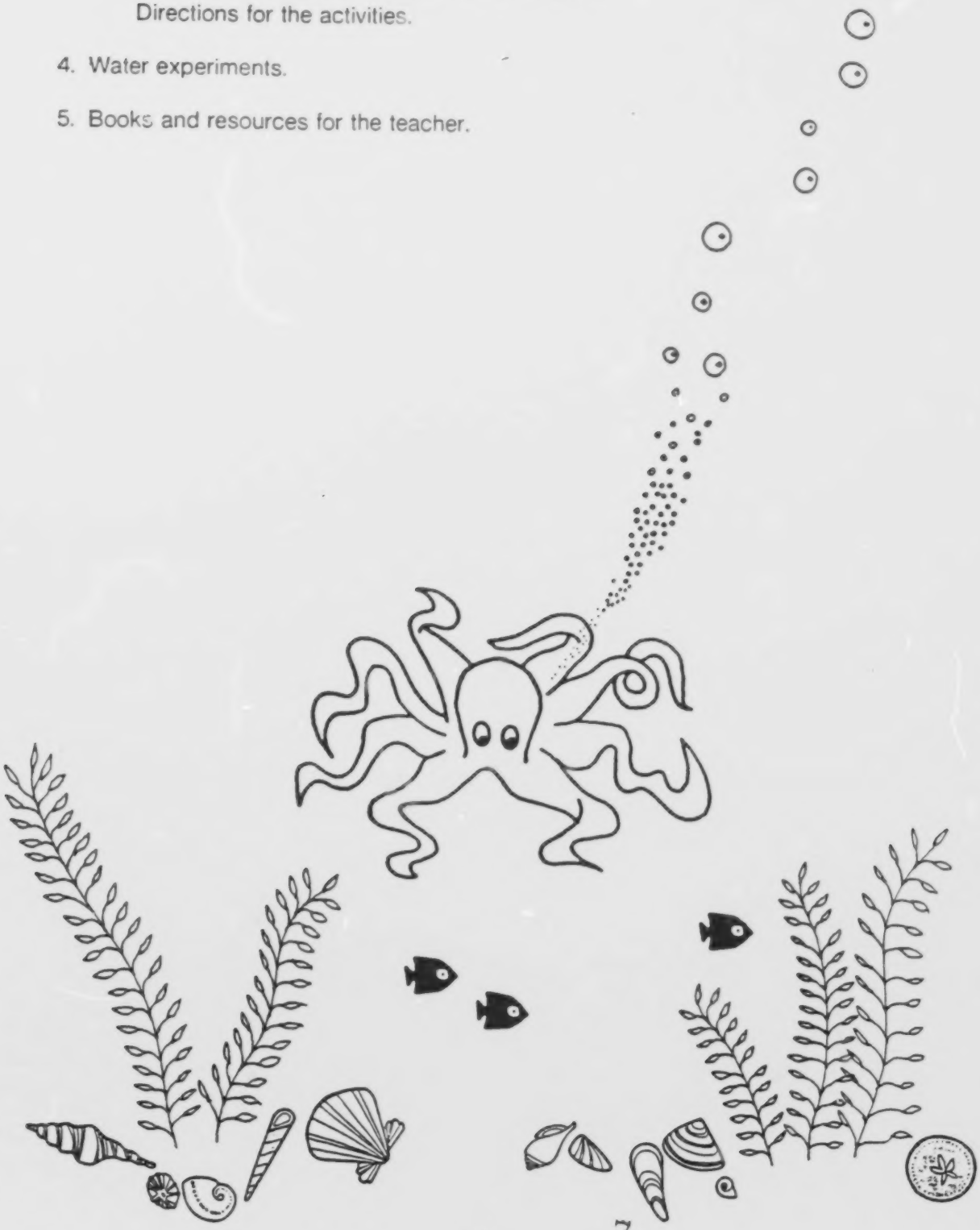
   Proficiency/indicator - These are the objectives which relate to subject areas.

   Materials - What you will need for the lesson.

   Directions for the activities.

4. Water experiments.

5. Books and resources for the teacher.



It is recommended that everyone start with GETTING YOUR FEET WET (an introduction to water study) and, then, follow your students' interests as to where you go next.

By following this thematic approach, you will see how easy it is to integrate subjects across the curriculum.

This will allow your day to flow with curriculum that is meaningful to the student without separating the learning experiences into separate subject areas. Your daily lesson plan may look like this.

Sample Daily Lesson Plan

1. Students enter classroom, take attendance, say Pledge of Allegiance. Have two or three math problems on the blackboard for students to work on paper. (Surfboard Math)

2. Start off the day with a poem or quote about water, if possible.

3. Current Affairs - sharing newspaper, magazines, TV, radio information about water with classmates.

4. SURF'S UP: Go over Surfboard Math problems using overhead or blackboard.

5. Share a piece of literature that will relate to the Core Knowledge you will be presenting as direct instruction.

   For example: If you were going to teach about the Mississippi River and transportation, you might select a tall tale about Mike Fink or read *The Little Tug Boat.*

6. Direct Instruction based upon Core Knowledge.

7. Integrated Curricular Activities.

8. Sum up the day's learning experiences in each student's personal ship's log.

9. Dismiss.

Grab your swim fins,
slip into your wet suit,
jump in, and
GET YOUR FEET WET!

ACKNOWLEDGEMENTS

The Indiana Department of Education
H. Dean Evans, Superintendent

Betty R. Johnson, Director
Office of School Assistance Center for School Improvement and Performance

Phyllis Usher, Senior Officer
Center for School Improvement and Performance

The Department would like to thank **Barbara Pedersen**, the 1989 Christa McAuliffe Fellow, and **Eric Stone** for their leadership in the development of these instructional modules. Special recognition is also given to the following individuals for their assistance in the development of these materials.

Marty Alenduff

Dave Ballard

Juma Bandawal

Lou Bowling

Karen Callahan

Harlan Day

Patricia Douglas

Linda Dunn-Halfaker

Angela Weir

Joe Wright

A special note of gratitude to **Phyllis Alexander** for editing and **Erin Payne** for graphics and layout. And, the entire Publications staff for their tireless efforts in developing these materials.

WET AND WILD WATER
Teacher Resource List

National Wildlife Federation
1412 6th Street NW
Washington, DC 20036

Sierra Club
Public Affairs Department
530 Bush Street
San Francisco, CA 94108

Center for Marine Conservation
1725 DeSales Street NW
Suite 500
Washington, DC 20036

United States Fish and Wildlife Service
18th and C Streets NW
Washington, DC 20240

National Audubon Society
950 Third Avenue
New York, NY 10022

Indiana Department of Natural Resources
Public Information/Education
612 State Office Building
Indianapolis, IN 46204

Indiana Division of Fish and Wildlife
Public Information/Education
612 State Office Building
Indianapolis, IN 46204

Wisconsin Department of Natural Resources
PO Box 7191
Madison, WI

International Joint Commission
PO Box 32869
Detroit, MI 48232

Denver Water Department
Office of Community Affairs
1600 West 12th Avenue
Denver, CO 80254
Attention: John Casson

American Water Works Association
6666 West Quincy Avenue
Denver, CO 80201
(Contact your local water company)

World Wildlife Fund
Publications Department OB
1250 24th Street NW
Washington, DC 20037

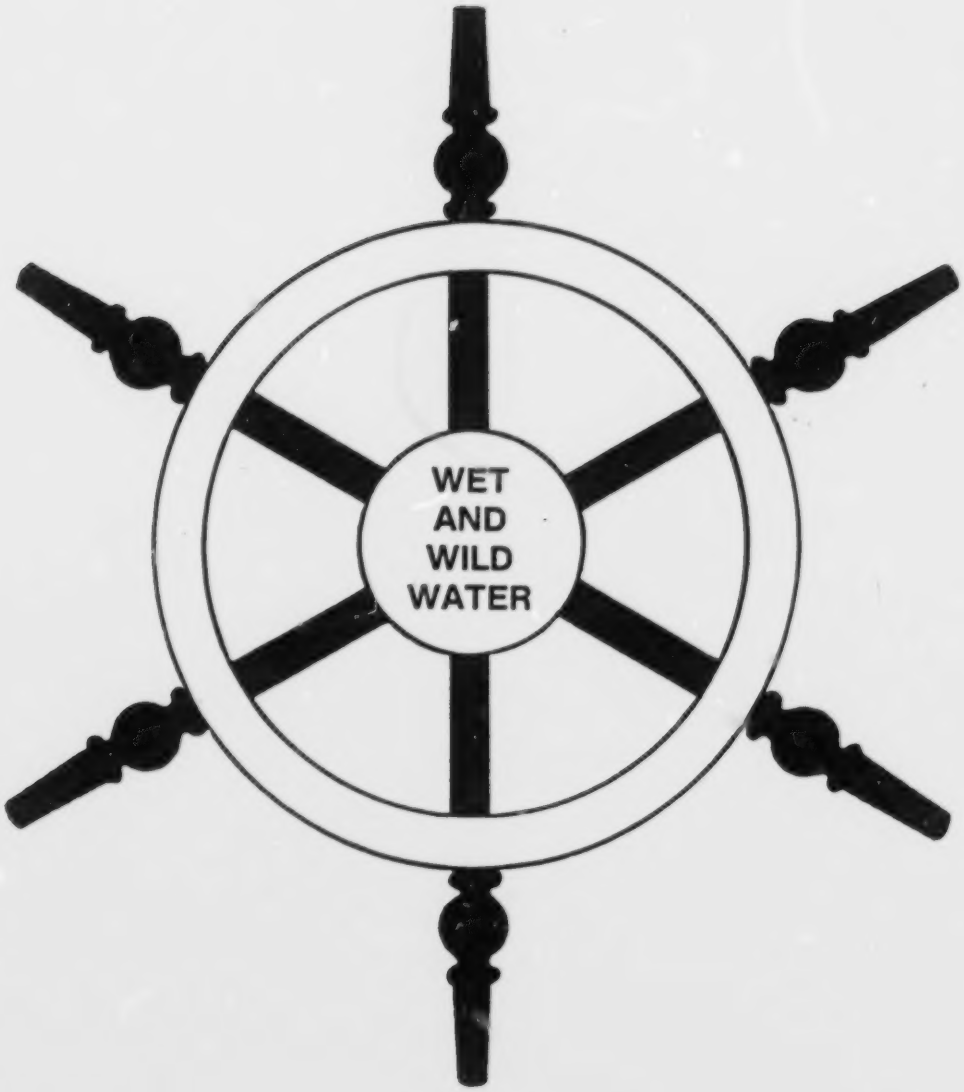
Indiana State Museum
Education Department
202 North Alabama Street
Indianapolis, IN 46204

Education Department
Marine World Africa USA
Marine World Parkway
Vallejo, CA 94589

GETTING YOUR FEET WET
An Introduction to Water

Water

First Day



WATER

The world turns softly
Not to spill its lakes and rivers.
The water is held in its arm
And the sky is held in the water.
What is water,
That pours silver
And can hold the sky?

Hilda Conkling

Random House, *Summer Day Song*
Copyright New York

Introduction

To help you have a better understanding of water, we have included information that we call Core Knowledge. This is teacher information. It is not our intent that all children master all Core Knowledge about water. What students learn about water will come from the activities and experiments you choose to teach, based on the Core Knowledge. A list of water experiments to be used throughout the study of water can be found at the end of this guide.

CORE KNOWLEDGE:
Water information for the teacher

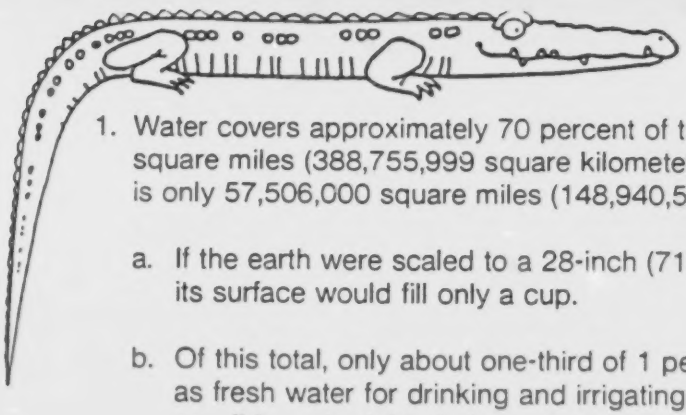
Water is one of the four elements (Earth-Air-Fire-Water). Without water, our planet would be uninhabitable because human beings, animals, and plants depend on water for life. Water falls from the atmosphere as precipitation and seeps below the surface, creating reserves of groundwater that we tap for our use. To live healthy lives, we must maintain earth's plentiful supply of clean water. There is the same amount of water on earth as there was millions of years ago. Just think, we could be drinking the same water Abe Lincoln drank.

THE VITAL STATISTICS OF WATER

	Area* (sq. mi.)	Volume* (cu. mi.)	% of Total*
SALT WATER			
The oceans	139,500,000	317,000,000	97.2
Inland seas & saline lakes	270,000	25,000	0.008
FRESH WATER			
Freshwater lakes	330,000	30,000	0.009
All rivers (average level)		300	0.0001
Antarctic ice cap	6,000,000	6,300,000	1.9
Arctic ice cap and glaciers	900,000	680,000	0.15
Water in the atmosphere		3,100	0.001
Ground water			
Surface		1,000,000	0.31
Deep-lying		1,000,000	0.31
TOTAL		**326,000,000**	**100.00**

*All figures are estimated

Source: U.S. Department of the Interior



1. Water covers approximately 70 percent of the earth's surface, or 139,434,000 square miles (388,755,999 square kilometers), while the land surface of the earth is only 57,506,000 square miles (148,940,540 square kilometers).

   a. If the earth were scaled to a 28-inch (71-centimeter) sphere, all of the water on its surface would fill only a cup.

   b. Of this total, only about one-third of 1 percent is actually available to humans as fresh water for drinking and irrigating (the water in lakes, rivers, and the accessible water table below ground).

   c. Seventy percent of the earth's surface is water, but less than 1 percent is fresh drinking water that we can drink.

   d. More than three-quarters of the fresh water along the earth's surface is frozen in the Antarctic ice cap.

   e. It has been estimated that as many as nine out of ten organisms in the world live in the oceans.

2. Water is the only inorganic substance existing on earth in liquid form.

3. Water is the only substance found in nature that can exist as a solid, a liquid, and a gas.

4. Water consists of two hydrogen atoms connecting to one oxygen atom (H_2O).

5. Water has weight.

6. Water is colorless, but can be colored by adding substances (food coloring, gelatin, ink, bluing).

7. Water takes the shape of the container into which it is poured.

8. The temperature of H_2O can be changed through heating and cooling.

9. Water evaporates or goes into the air.

10. Almost every other substance becomes heavier, smaller, and more dense as it changes from a liquid to a solid. But water expands and grows lighter, so that ice floats. If that does not seem remarkable, it should. If water acted like other substances, its solid form, ice, would sink. The floor of the sea and the bottoms of lakes would accumulate ice. Gradually, winter after winter, the ice would lock up more and more water until there would be none running free on the planet. There would be no life on earth.

11. More substances can be dissolved by water than by any other material. The water molecule, with its magnet-like opposite charges, is able to carry other substances suspended within itself, making it a nearly universal solvent.

12. Water is able to climb of its own accord, a feat that results in capillary action in soils and in plants. Without this characteristic, water would not travel from the deepest root tip to the highest leaf. There would be no internal flow of nutrients in complicated organisms, and thus, no complicated organisms. The trick occurs because the attraction of water molecules to themselves and to other molecules is so strong they are drawn upward from one foreign molecule to another, always pulling along the adjacent water molecules. The climb is halted only by gravity.

13. Great amounts of heat can be absorbed by water, making seas, rivers, lakes, and clouds vast energy storage banks. The release of stored heat from the ocean, for example, moderates climates, making coastal winters milder than those only a few miles inland.

14. Water is a basic ingredient for our bodies; we need it to survive!

15. People can live longer without food than without water. This is because water regulates the temperature of the body; carries important nutrients to organs, cells, and tissues; and removes wastes from the body.

16. Over 70 percent (approximately two-thirds) of our body weight is water. That is why it is important to eat and drink foods that contain water.

17. Water makes up over 80 percent of our blood and lubricates body joints. Each day humans must replace two quarts of water to maintain their health.

18. Human blood, excluding the cells and proteins, has the same general composition as seawater.

19. There is a water cycle. Water in the air condenses into clouds and comes to the ground in various forms of weather - rain, snow, sleet, and hail. It then collects in lakes, seas, and ponds. From there, rivers and streams carry it to reservoirs and storage tanks. After purification, it is carried through underground pipes into homes, schools, and buildings. The total amount of water on the earth remains essentially constant. Water changes form, but does not disappear. The water cycle has no starting or ending point. Water molecules you drink today may have been in the water consumed by a dinosaur that lived millions of years ago.

20. Each community in Indiana has a watershed. A watershed is a water storage area. It includes streams, ponds, forests, yards, parks, school playgrounds, and streets. We need to manage (take care of) watersheds to make certain we will continue to have an adequate supply of safe and usable water for people, plants, and animals.

21. Water has many uses.

    a. Man - drinking for survival; washing and cleansing of self, clothes, home, food; watering crops, gardens, and all plants in surroundings; cooking; ice for preserving and cooling foods; steam for cleaning, ironing, pressing, removing wallpaper, stamps, or other items glued to surfaces; in generators; and in steam turbines.

b. Animals - survival; habitat

c. Plants - survival; habitat

22. Many forms of recreation utilize water.

a. Fishing

b. Boating

c. Swimming

d. Waterskiing

23. Water is involved in many professions. .

a. Firefighting - extinguishing fires

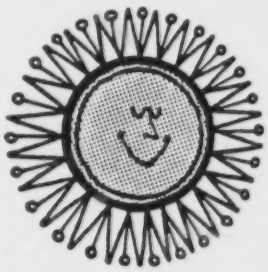
b. Fishing

c. Sailing - protecting the seas

d. Plumbing - repairing water pipes and water systems

24. Earth's Weather Facts

- Heaviest Rain in 24-hour period:
  73.62 inches
  186.99 centimeters
- Wettest Spot:
  Island Kauai, Hawaii
  Annual Rainfall
  460 inches
  1,168 centimeters



- One year record:
  Cherrapunji, India
  1,042 inches = 2646.7 centimeters
- Driest Spot:
  Atacama Desert, Chile - rainfall barely measurable
  Calama, Chile - no rain has ever been recorded

- Largest hailstone:

  17 1/2 inches around

  44.5 centimeters

  weight: 1 lb 11 oz = 765.4 grams

- Weather is the condition of the air that surrounds the earth.
- Humidity = measure of the amount of water vapor in the air.
- Precipitation = moisture that falls from clouds in form of rain-snow-sleet-hail-fog.

25. Water Cycle Vocabulary

Water - a liquid falling from clouds. A major component of all living matter - odorless, tasteless, H_2O.

Molecules - the smallest particle of a substance composed of one or more atoms.

Water cycle - the continuous renewal of water through the processes of evaporation, condensation, and precipitation.

Precipitation - rain, snow, sleet, hail, fog.

Evaporation - reducing amounts of water vapor through invisible particles rising.

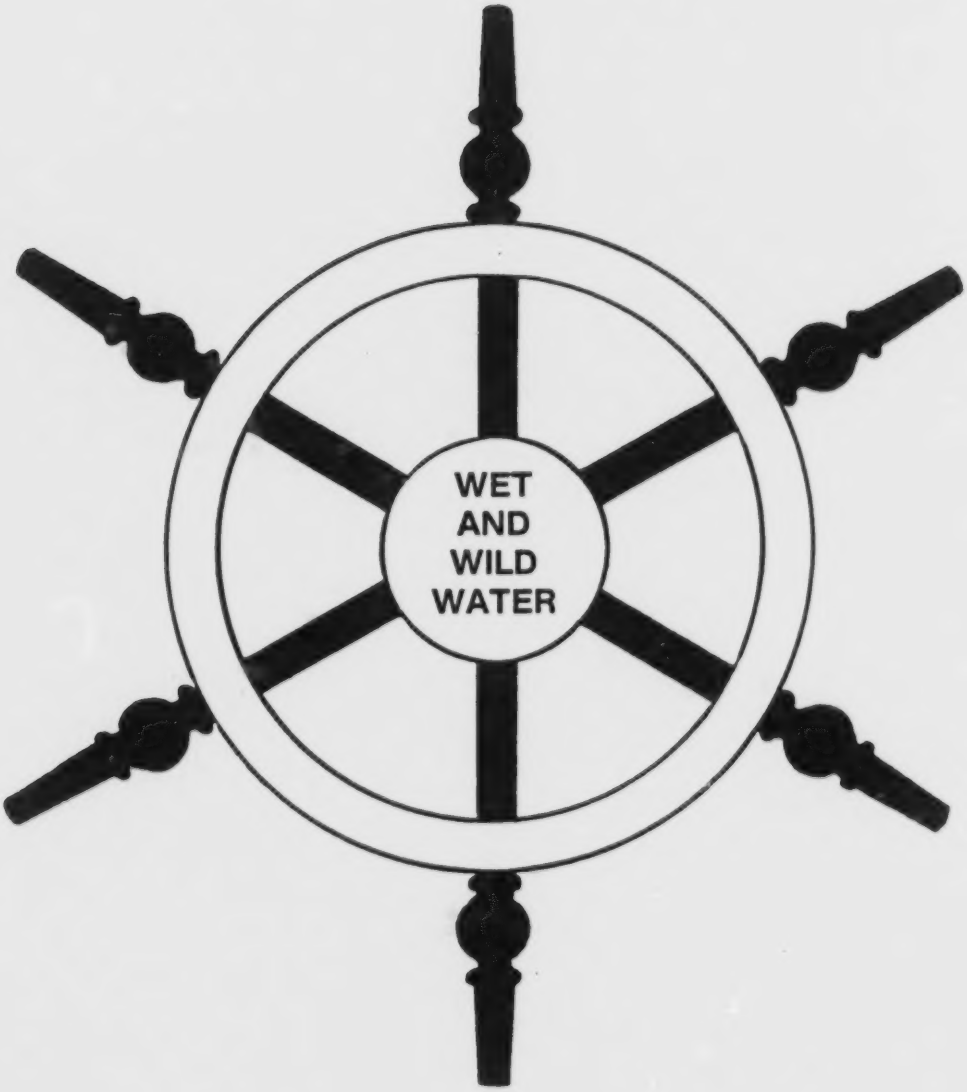
Condensation - water vapor rises and collects with other vapor to form clouds.

Now that <u>you</u> have a better understanding about water, let's bring on the students!

GETTING YOUR FEET WET
An Introduction to Water

Water

First Day



FIRST DAY

1. Greet your students at the door dressed in water attire, i.e., swim fins, snorkel, life jacket, air tank, wet suit, goggles, surfboard, or fishing attire with waders and fishing pole.

Getting Your Room Ready for WET AND WILD WATER

- Water information reference table - collect books from the library about water and contact local water utilities for information. See page 33 for additional resources.
- Current Affairs - a bulletin board consisting of newspapers and magazine articles for children to bring in relating to water. Encourage children to be "roving reporters," constantly searching for H_2O information.
- Word Water Bank - water vocabulary words can be displayed on wall as you use them.
- Place water pictures around room.
- Have water music playing.
- Display water resource books around chalkboard and on table.
- Set up a goldfish and water animal aquarium.
- Hang inflatable water toys around the room.
- Hang blue crepe paper from the door.
- Run humidifier to create steam.
- Pass out manilla folders for students to decorate about their study of Wet and Wild Water.

2. Have the theme words WET AND WILD WATER displayed on the wall along with room guidelines.

   - No Dunking
   - Active Listening
   - Go For The Gold

3. Bring class together in a circle. Introduce yourself and ask what the children think the theme for the year will be. Go around the circle and have each child introduce himself with a describing word that relates to water, i.e., Swimming Eric, Diving Dan. Intermediate children may use an adjective with their names. Have each child repeat the names already mentioned before saying his own name. Process this activity by asking how they felt when it was their turn (take a few responses). Validate activity by saying, "I liked the way you cooperated," or, "I liked Sara's idea; it was very clever."

4. SETTING YOUR COURSE

   - No Dunking - We will not put down anyone in this class. Everyone is entitled to his/her opinions.
   - Active Listening - We will listen to each person when he or she is talking.
   - Go For The Gold - We will all give 100 percent and have pride in our work.

5. As a class, brainstorm all the thoughts that come into the children's heads about water. This may be recorded on a chalkboard or chart paper. This will show you where their interest and water knowledge is.

6. Pass out prepared cards with pictures of four different water creatures or water words on them. When the students draw a card, they are to find the card that matches the card already placed on the table or desks around the room.

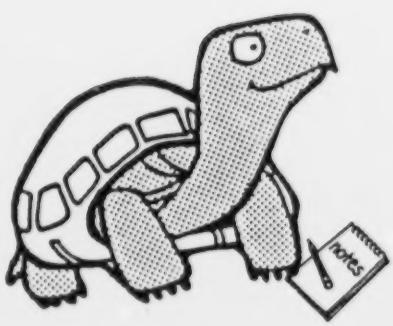
   This activity will put the students into groups at each water table around the room. Have the members of the group introduce themselves to each other and choose a number for each member (1-2-3-4).

   Tell the class you want each group to take ten minutes to discuss what they already know about water and water-related ideas.

   1 will be the timer.

   2 will be the lifeguard. His job is to keep everyone on task.

   3 will be the recorder. His job is to write down everyone's ideas.



   4 will be the reporter. He will report the findings to the entire class and post papers on the wall.

7. Thirsty? Go get a drink.

8. Read the water poem on the following page. This poem can be used while introducing the water cycle.

WATER

Learn the wisdom of the water.
It falls freely from the sky as the rainsong
Giving itself joyfully to the
External process of purification and renewal.

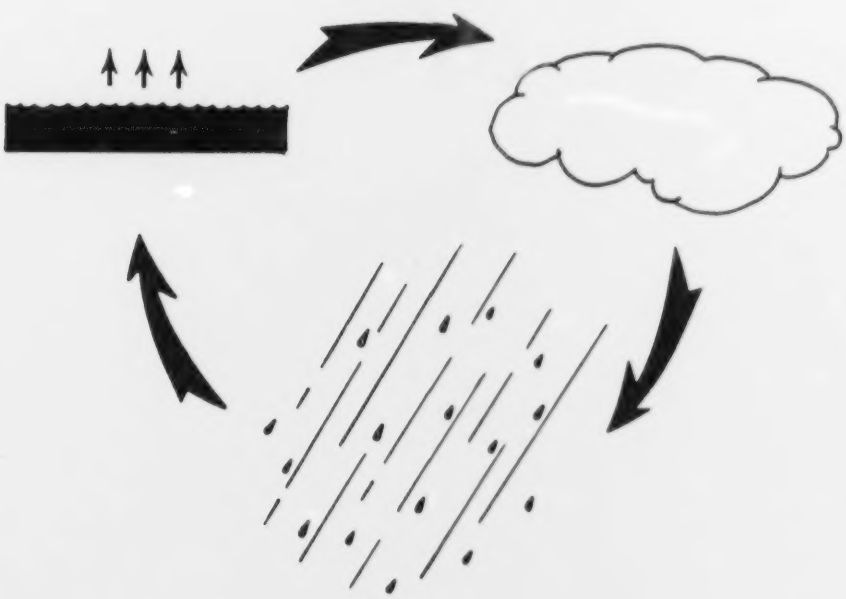
In the stream, when it encounters the rock -
it flows gracefully around and does not waste
energy in useless argument.

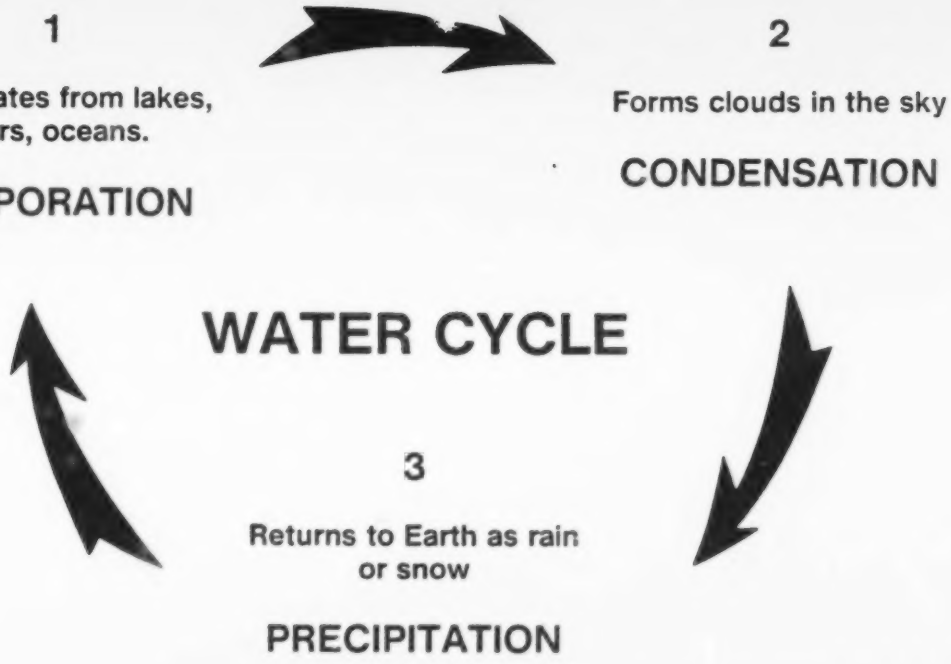
In the lake it sits peacefully until it becomes
clear and then surrenders to the call of the sun to be
drawn up and begin anew. The water knows not fear.
Learn the wisdom of the Water.

Author Unknown

9. This information about the water cycle could be used to make overheads for Primary/Intermediate levels.

Primary: What Goes Around Comes Around (Water cycle)





10. Read "Sun, Moon, and Water" to the class, connecting literature to the study of water.

SUN, MOON, AND WATER
Nigerian Legend

Many years ago, before humans lived on this planet, Sun and Moon were married and lived together in a hut in Africa. They were very happy. They had a friend, Water, who lived far away from them in her own hut. Sun liked to go visit her from time to time and would then return to his wife, Moon.

One day, when Sun was with Water, he said, "I always come and see you, but you never visit us. Why don't you come and visit our hut?" "I would love to meet your wife, Moon," Water replied. "I am afraid your home would not be big enough for me and all the life I carry. You see, I bring with me so many fish of all sizes, whales, sharks, salmon, trout, starfish, and even minnows."

Sun boldly answered, "Don't worry, I will rebuild our hut and make it larger so you can come and visit."

He returned to Moon and told her what he wanted to do and Moon, watching him build on to the hut, hoped he wasn't getting carried away.

Sun built a house so huge it stretched as far as you could see. Meanwhile, Moon prepared for a visit from Water, and Water watched and waited for the day she could go and visit Sun and Moon.

The day arrived for Water to come. Sun and Moon stood at their new door and watched. Water moved and spread in all directions. She came swirling around the trees and lapping at the smooth rocks at the foothills of the mountains. On and on she flowed until she arrived at the home of Sun and Moon.

"I have arrived, and I am so happy to meet you, Moon. Sun, you have built a beautiful home," she said.

"Please come in," said Sun, excitedly.

"I think I will," replied Water, "But we have not all arrived. Can you fit us in?"

"Sure," Sun replied, opening the door wider, and Water rose above the steps.

Water flowed freely through the house and began to go up the walls that creaked with the pressure of her weight. Moon, sitting in a window frame, glared palely at her husband.

"I feel you're going to overflow us," she said, watching Water's slow ascent.

"Nonsense," Sun replied. "These rooms are large enough for all of us."

Moon looked outside and saw how Water advanced slowly, steadily, spreading all over the land. She didn't want to sound alarmed, but she noticed that the distant forests were gone and only the peaks of mountains showed above the flat surface of Water. Why did Sun insist on her visit? What if they drowned? She called to Sun to come and see, and he waded across the floor towards her. He felt many fish brush against him as they darted madly from room to room.

"Are you sure you can hold us?" asked Water, thinking she might be imposing. "Think nothing of it," replied Sun, though he now realized he had to swim because his feet no longer could touch the floor.

At the window, Sun and Moon stared at the wet world outside. Now and then they saw a porpoise leap above the level line of water or a whale blow into the air before he sank and disappeared. Flying fish leapt about laying in their new found freedom.

"I am sure Water will overflow us," said Moon as she stood on the window frame.

"Our home is big enough, and we don't want to offend our friend," Sun pleaded.

"Am I too difficult a guest?" asked Water. Neither Sun nor Moon heard her. They had scrambled onto the roof in an effort to save themselves from Water's ascent.

"We are being overflowed. We must escape!" she cried. She looked around and saw that the only space was immediately above. They leapt into the sky. Their first step took them hundreds of thousands of miles. They raced across the air very fast. Finally, when they knew they were far enough away from her, they looked back to see how Water swirled across the earth, leaving only patches of land that were high enough to rise above her.

Sun and Moon stayed in the sky. There they gave birth to their children, the stars. They would have been happy, but Moon always complained about having to leave their first home.

Moon often reminded Sun what a bad idea it was to ever invite Water to their house. Sun got tired of being reminded of their loss and grew angry with Moon. Moon would try to get rid of Water from the huge patches of Earth she now inhabited. Water fell away from the coasts, showing the sand beneath her. The effort tired Moon, and just as frequently, Water slipped back to where she lapped along the shore. She saw Sun and Moon from wherever she roamed. She never understood why they had abandoned her.

Moon was not able to forget a thing. She scolded her husband constantly, until late one evening, she could not stand his excuses any longer. She woke all her children, the stars, and quietly moved them with her to another part of the sky.

From that moment on Sun searched for her, burning brightly to give himself light to find her. In the evening, he was so exhausted that he dropped down in the West to seek some solitude. It was then that Moon came out of hiding and urged the stars to follow her. They scattered and danced across the sky. So happy to be free.

Even to this day, the Search goes on. Sun tours the sky, shining hard to find his wife, and Moon stays hidden till night. They may never meet again. Water profits from the company of both of her friends. During the day, Water feels the warmth of Sun's light sparkling upon her moving back. At night, she is cooled by the touch of Moon's shine.

Once in awhile Moon, because she is still angry, sometimes hides from Water, too. Then all is dark and black, and the earth must wait for Sun to begin his trip across the sky.

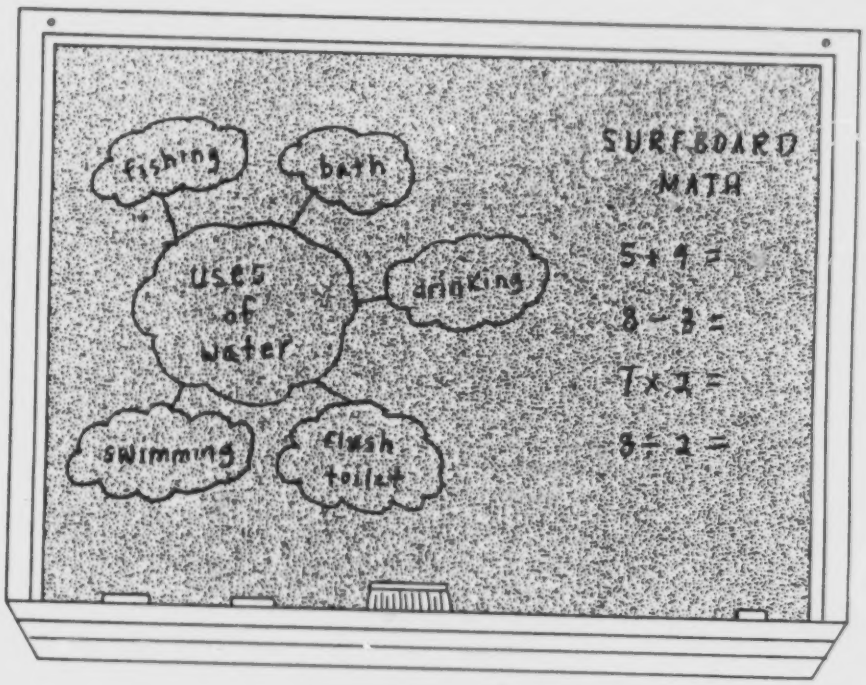
After reading the Nigerian Legend entitled, "Sun, Moon, and Water," you may want to flow into imaginary experiences as described in Movie Time found in the Activity Section.

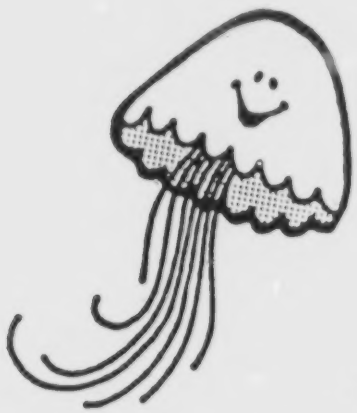
WRAP UP THE DAY

Tomorrow you may want the students to bring a life box containing three things that are important to them. One of the items needs to relate to water in some way. The children can share these with each other to build inclusion and a sense of family in the classroom.

After children leave, look at the chart with brainstorming about water and decide what interest areas you want to be sure to teach this year.

Go home and take a hot shower; you deserve it! What a wonderful first day of school. You are off to a great beginning!





I KNEW YOU COULD DO IT!

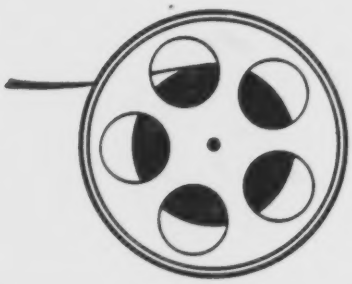
27

Activities for Getting Your Feet Wet

The introductory activities and water experiments in this section show how all your subjects can relate to water. You may use these where meaningful.

Use as little or as much as you wish. You may want to incorporate these ideas along with work you have already planned for your students.

Choose the activities that will interest your children and that are appropriate for their grade level.



Activity 1: Movie Time

Proficiency/Indicator:

Reading Respond actively and imaginatively to the literature they encounter.

Materials: Environmental record with sounds of the sea. (These can be found at bookstores and record shops - example, Nature Company.)

Directions: Read several poems involving water and water life. Play an environmental record with the sound of the ocean. Close your eyes and run a movie through your mind about the ocean. Write a story or draw a picture telling or showing about the pictures that came in your mind.

Activity 2: Sun and Moon

Proficiency/Indicator:

Mathematics Demonstrate computational skills with whole numbers.

Materials: Read *Sun, Moon, Water;* pictures of constellations

Directions: Talk about "far" and "close"; discuss what is closer - the Sun or Moon. Look at star constellations and count the stars. Make up math problems about the constellations.

Activity 3: What's Funny in the Sea?

Proficiency/Indicator:

Language Arts View language as a powerful tool for learning and thinking and as a source of pleasure.

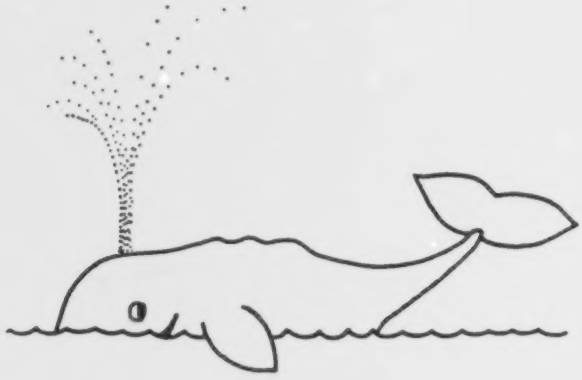
Materials: Paper and a good sense of humor

Directions: Have the children work in small groups, and write water jokes. Illustrate the jokes and share them with the class.

Example:

Question:
Who is the messiest water creature?

Answer:
The Slobster (Ha!Ha!)



Activity 4: Thar She Blows!

Proficiency/Indicators:

Science/ Fine Arts Use simple instruments to describe observations more accurately.

Materials: Large sheet dyed; markers; newspaper/optional (velcro sewed on bottom of sheet for slit)

Directions: Make a life-sized seal, whale, or dolphin, out of dyed sheets stuffed with newspaper and hang it from the classroom ceiling. Think Big! Create internal organs and place them inside the animal. You can have a velcro strip sewn into its abdomen. Have students compare their own body size to that of the model. Use measuring tape, yardstick, and rulers.

Activity 5: Water Animal Math

Proficiency/Indicator:

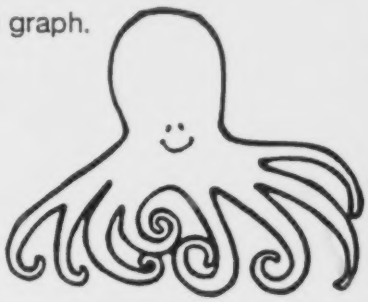
Mathematics Collect, organize, display, and interpret data.

Develop problem-solving strategies.

Materials: Measuring tape, chalk, graph paper

Directions: Go outside, and using measuring tape and chalk, mark out the sizes of ocean animals on the blacktop. Put one child at the end of each line. Show a picture of the animal you are measuring.

Chart the sizes on a graph: Put pictures on graph.

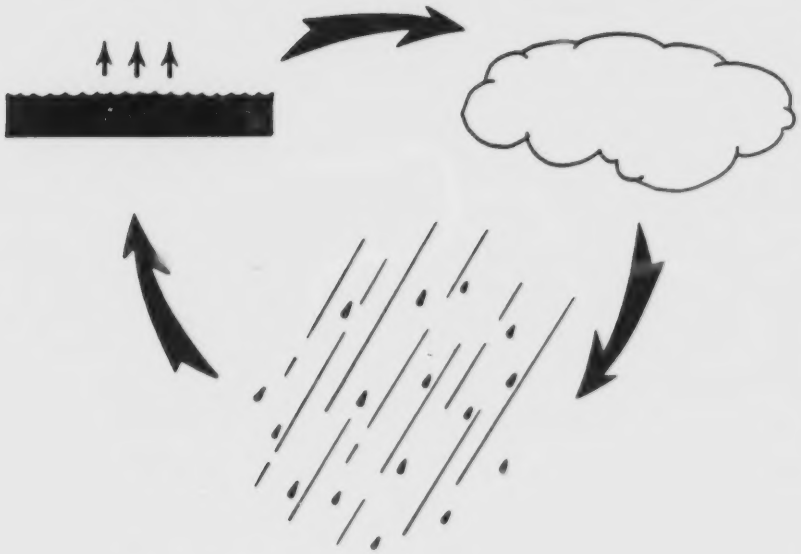


Starfish - 8 inches
American Lobster - 2 feet
Elephant - 18 feet
Plankton - microscopic
Octopus - 30 feet
Dolphin - 13 feet
Humpback Whale - 60 feet
Blue Whale - 100 feet

Have a class discussion about your data.

Sample questions:

1. How do animals get to be so large in the water?
2. Compare the size of land animals to water animals.
3. How many starfish would it take to equal one lobster?



Activity 6: Water Cycle

Proficiency/Indicator:

Science Use a variety of skills to communicate scientific and technological information.

Materials: Large container of water

Directions: Have children lift the container of water to see how heavy it would be to carry if you were a cloud. Point out if everyone takes a little of the water it would not be so heavy. Divide the group in two groups and have them line up behind two lakes (two containers of water labeled lakes). Have the children face the clouds (two empty containers labeled clouds) at the other end of the classroom (or you can do this outside). Give each child a paper cup and tell the children, for water to rise up and form clouds, the water needs the sun's heat. You each are to pretend you have the sun's energy. When it is your turn, take your cup and fill it from the lake (water container) and walk over to the clouds (empty container). If you are outside, you can run. Pour the water in the empty container when you get there. Now, the next person can bring his or her water to the clouds.

When finished, sit in a circle. Now, it is time for the clouds to rain, so repeat activity by taking water from the clouds and pouring it into the lakes. Now, the water cycle is finished.

Addition: Make up a play or story about a drop of water that travels through the water cycle.

Activity 7: Water Haiku

Proficiency/Indicator:

Oral Communication

Use a variety of techniques to express thoughts and feelings to respond to others.

Write for different purposes and audiences using a variety of forms.

Materials: Sand, shells, starfish, pebbles, any material you would find on the seashore

Directions: This can be done individually or as a group. Write a haiku about one of the above items.

Haiku has three lines.

1. five syllables
2. seven syllables
3. five syllables

(sample haiku)

Sunlight is dancing
The water is glistening
The ocean is mine

Activity 8: Water Cinquain

Proficiency/Indicator:

Oral Communication

Use a variety of techniques to express thoughts and feelings and to respond to others.

Write for different purposes and audiences using a variety of forms.

Materials: Background discussion about water.

Directions: Write a cinquain about water.

Cinquain has five lines.

1. title two syllables
2. describes title = four syllables
3. bring title to life = six syllables
4. describe emotions = eight syllables
5. topic again, but different word = two syllables

(sample cinquain)

Seashore
Sandy and clean
Glistening white powder
Peaceful sand castles stand alone
Beachside

Activity 9: Water Math and Map Skills

Proficiency/Indicators:

Mathematics Use fractions to express mathematical concepts and relationships.

Science Explore things and events to better understand the world.

Materials: Information asking, "How much is 42 million gallons of water?"

Enough water to fill a glass 100 feet in diameter and 715 feet high. (Measure this with yarn on the playground.)

Enough water for everyone in Chicago to brush their teeth seven times. (Locate Chicago on a map and its population.)

One day water supply for the State of South Dakota. (Locate South Dakota on a map and its population.)

How much water flows over Niagara/Horseshoe Falls in one minute and 14 seconds? (Show picture and time this.)

Almanac and map of the United States; information above to use for an interest introduction to the activities below.

Directions: Children can individually or in small groups create story problems based upon the above information.

Extended Activities: Over 70 percent of our body weight is water. Weigh children and figure how many pounds of their weight is actually water. They could create a pie graph.

What goes here?
Love
Pizza,
etc.

On average, a person takes in about 16,000 gallons of water during his or her life. Ask children to design a formula that would determine the amount of water they have used in their lifetime.

Activity 10: How Do We Use Water?

Proficiency/Indicator:

Science Sort, group, or arrange objects, systems, ideas, or events on basis of similarities, differences, or a suggested standard.

Materials: Paper, magazines, glue

Directions: Have students make a list of all the times they use water in one day. Then ask them to draw or collect pictures of people, plants, or animals using water. They may be drinking or playing, cooking or cleaning with water. Have students assemble a book with a chapter for each type of activity.

Measure amount of water used to brush your teeth and report to class.

Extended Activity: Write to the International Joint Commission and ask for the Water Conservation Wheel. (See resource section.)

Experiments for Getting Your Feet Wet

These experiments are included for your class to use as they learn about water.

MAKING RAIN

Laboratory Time: 20 minutes

1. Experiment can be used with water cycle. Students will learn how to make rain.

Proficiency/Indicator:

Science Use data to forecast or predict future events or conditions.

Materials: Hot plate, two pans, water (enough to fill one pan one-half to three-quarters full), ice cubes (enough to fill one pan)

Directions:

A. Plug in hot plate. Place where everyone can see it.

B. Put the water in one pan, so it is one-half to three-quarters full and place on hot plate to boil.

C. Put the ice cubes in the second pan and hold it over the pan on the hot plate (probably 8-10 inches above it). Hold it there for several minutes until condensation forms at the bottom of the top pan.

Expected Results: The boiling water's steam will melt the ice cubes causing condensation on the bottom of the top pan. When the condensation is heavy enough, the droplets will fall as rain.

Practical Applications (Questions to ask):

A. Who could tell in their own words what happened in order for us to make rain?

B. What does condensation mean?

C. What was the pan of ice representing?

D. What was the pan of boiling water representing?

E. What made the droplets of water fall?

Observe the forms and cycles of water by first discussing ice cubes and how they are formed. Then put them in an electric frying pan with the temperature on low. Observe as the ice cubes change to water, then to steam, as the water boils. Hold an aluminum pie plate above the steam to collect some of the moisture and, then, observe the drops of water on the pie plate.

Allow children to experiment with substances that dissolve in water and substances that do not dissolve in water. Compare sand, salt, marbles, an antacid tablet, flour, tapioca, soda, sugar, gelatin, and/or powdered drink.

Give children two ice cubes each. Have them sprinkle rock salt on one ice cube and, then, press the ice cubes together. The children should be able to see that the salt melts the ice. Try the same experiment with small rocks and note the difference.

Fill a large glass or plastic container partly full of water and mark the water level. Put the container in the freezer or outside, if the temperature is below freezing. After the water freezes, determine whether the ice line is above or below the water line. The children should discover that when water freezes, it expands. Allow the container of ice to melt back into a liquid. Compare ice and water lines again.

Fill two clear glass containers with water and mark the water levels. Leave the lid on one of the containers; leave the other container uncovered. Each day, observe and mark the water level in the uncovered bottle. Frequently, compare the current water levels in both containers. Include the word "evaporation" often in the discussion.

Have children take turns lifting different containers of water. They can lift a glass of water, but what about a pitcher or large bucket of water? Can they lift the pitcher or bucket without the water in it? Water has weight.

Compare the weight of a dry sponge with the weight of a wet sponge. Compare the weight of dry clothes with the weight of damp clothes and those that are wet.

With the water tables, basins, or tubs, provide opportunity for pouring and measuring. Provide a variety of containers of various sizes for the children to play with. Encourage exploration of more or less, substance, volume, and weight. Also provide small plastic bags to demonstrate that water has no definite shape, but takes the shape of the container it is in.

Water laying in a water table or basin can interest children for long periods of time. Other materials that can be included with the water on various occasions are sponges, straws, strainers, eggbeaters, medicine droppers, syringes (without needles, of course), rubber bulb with perforated nozzle, hollow rubber ball with a hole in it, rubber or plastic tubing.

Place an ordinary drinking glass in a dish and fill it carefully with water. As it is filled, carefully pour more water into the glass and the water will bulge above the edge of the glass, and form a convex shape. This is because of surface tension. To show the effect of detergents on water, a drop of liquid detergent placed into the water will cause it to flow over the edge of the glass.

A needle, which is more dense than water, will float on top of water. This can be accomplished in two ways. One way is to hold the needle between the thumb and forefinger, lower the needle down toward the surface of the water in a glass as close as possible without getting the needle wet, then drop it. If the needle is dropped parallel to the surface from such a short distance, the result should be that it floats. Use hard water, if possible. The second method is to place a small single layer of toilet paper or tissue on top of the water, then, place the needle on top of the paper. Then, with a small pointed object, such as a toothpick, gently push the paper downward away from the needle.

Punch four or five small holes in a gallon can or a quart juice can, starting at the bottom and having the holes about an inch apart. Plug the holes with small pieces of wood, then, fill the can with water. As the plugs are pulled out rapidly (beginning with the bottom one), the water will shoot out the hole farthest from the bottom and least from the top hole. This shows that the deeper the water is, the greater the pressure.

Fill a large small-mouth bottle with water. Fill a small test tube or small cylindrically shaped bottle about half full of water. Invert it, placing it upside down into the large bottle. The amount of water in the test tube is critical and should be just enough so the test tube will not sink. Make sure the water comes to the top of the large bottle. Place your hand on top of the bottle and as you push down, the test tube will sink to the bottom. As you lift your hand and push down again, you will find that the small test tube will go up and down. This is because air will compress and water will not, so when you push down with your hand, water is forced into the test tube, making it heavier so that it sinks.

Wipe the chalkboard with a damp cloth. Watch the dampness disappear as the water evaporates. Also, water can be observed to evaporate as a pan of water is boiled away on the stove.

A simple, accurate rain gauge can be constructed using an 8-inch funnel mounted in a box with a 2 1/2-inch diameter can underneath the funnel. The funnel should be mounted so no rainwater seeps past the outside down into the catch can. The ratio of the area of the funnel to the catch can (an ordinary soft-drink can works well) is 10:1. So when measuring the accumulated water in the can with a ruler, you must divide the water level by ten. For example, if after a rainfall, 1 1/2 (1.5) inches of water were measured in the can, this would indicate 0.15 (or 15 hundredths) inch of rain.

Suggested Music for Introduction to Water

Splish Splash I Was Taking a Bath

Stormy Weather

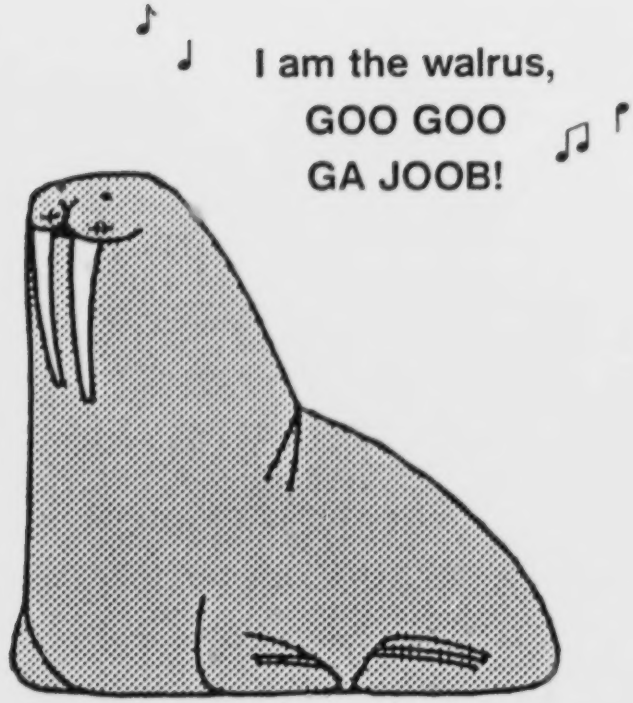
Singing in the Rain

Raindrops Keep Falling on My Head
B. J. Thomas

Robin in the Rain
Raffi

Rain
Beatles

Rain Came
Jimmy Ryser



Resources for Getting Your Feet Wet

When It Rains - Mary DeBull Kwitz, Follet, 1974.

If All the Seas Were One Sea - Janina Domanska, Macmillan, 1972.

Bringing the Rain to Kapiti Plain - Verna Aardema, Dial Books, 1981.

The Sea - Leonard Engle, Time-Life Books, 1971.

Look Out - Rena Kirkpatrick

Weather - Raintree Publishers, 1988.

A World in a Drop of Water - Alvin and Virginia Silverstein, Atheneum, 1969.

I Can Be a Plumber - Dee Lillegaro and Wayne Stoker, Children's Press, 1987.

WATER: The Universal Solvent - Frank N. Kemmer, Nalco Chemical Company, Oak Brook, Illinois, 1979.

Messing Around with Water Pumps and Siphons - Bernie Zubrowski, Little Brown and Company, Boston, Massachusetts, 1981.

The Trip of a Drip - Vicki Cobb, Little Brown and Company, Boston, Massachusetts, 1986.

Water - Alun Lewis, Franklin Watts, New York, 1986.

Drop by Drop: A Look at Water - A. Harris Stone, Prentice-Hall, New Jersey, 1969.

The Man Who Didn't Wash His Dishes - Phyllis Krasilousky, New York, Doubleday, 1950.

The Rain Puddle - Adelaide Holl, Lothrop, Lee & Shepard, New York, 1965.

Weather - Man Changes the Weather, Ben Bova, Addison Press, 1973.

(Weather) Out & About - Shirley Hughes, Lothrop, Lee & Shepard (K-3, Primary), 1988.

Weather Forecasting - Gail Gibbons, 1989.

Rain - (Wordless picture book) Peter Spier, Doubleday, New York, 1982.

Rain Makes Applesauce - Julian Scheer, Holiday House, New York, 1964.

Rain, Rain, Rivers - Uri Shulevitz, Farrar, Straus, and Giroux, New York, 1969.

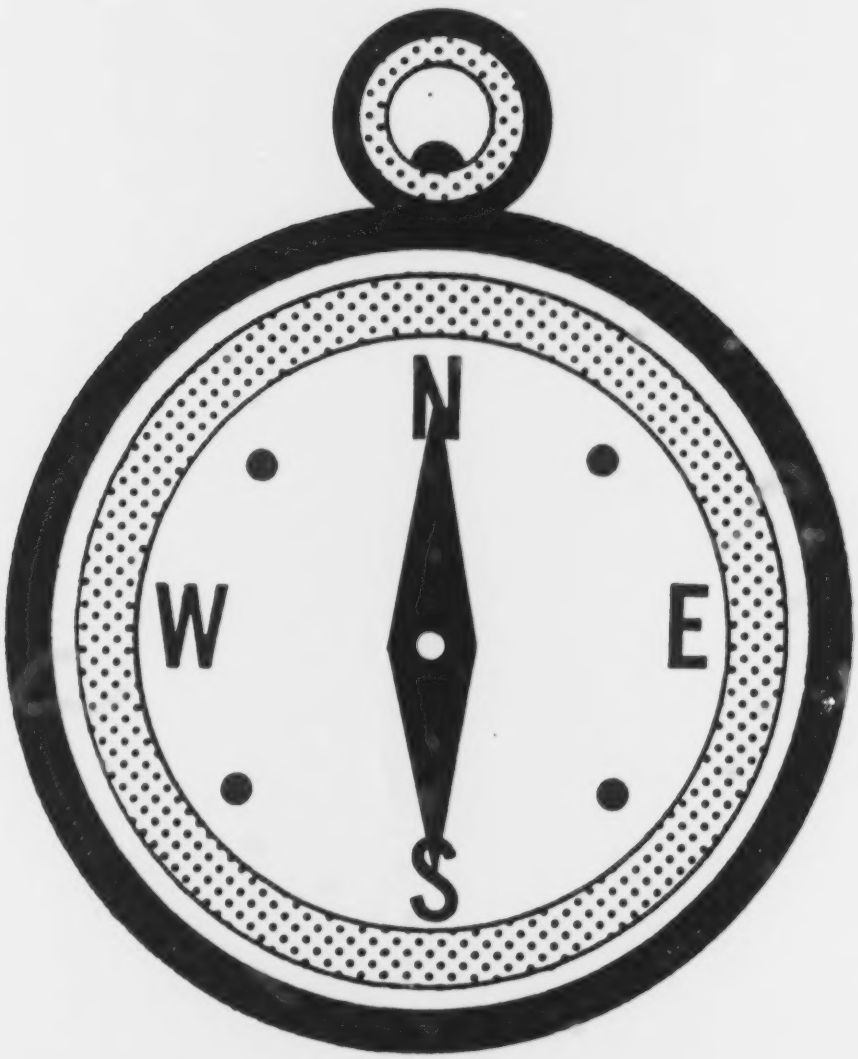
Storm - Victor Boesen, Putnam, 1978.

Notes

Now that you have navigated through this introduction, you are ready to pilot your ship by plotting your course and heading to the shores of integrated learning.

At first, you may feel like a fish out of H_2O, but do not clam up! Your initial "floundering" will lead you to become a starfish!

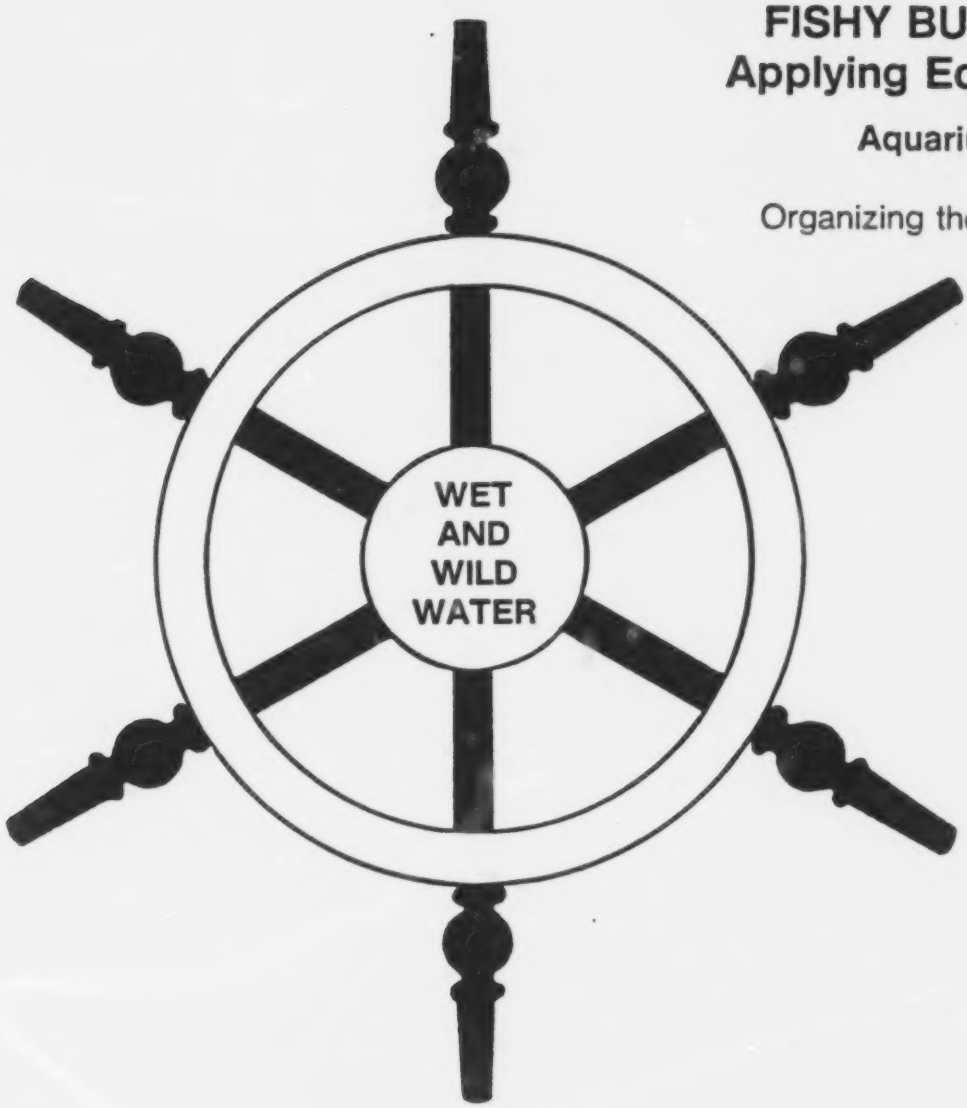
You may use this guide as your compass to help you set sail for new opportunities in teaching and learning. Your teaching will make waves! Ship Ahoy!



FISHY BUSINESS
Applying Ecomomics

Aquariums

Organizing the Business



This topic can be an ongoing study of economics in the classroom related to fish.

FISHES' EVENING SONG

Flip, flop,
Flip, flap,
Slip, slap,
Lip, lap;
Water sounds,
Soothing sounds.
We fan our fins
As we lie
Resting here
Eye to eye
Water falls
Drop by drop,
Plip, plop,
Drip, drop.
Plink, plunk,
Splash, splish;
Fish fins fan,
Fish tails swish,
Swush, swash, swish.
This we wish . . .
Water cold,
Water clear,
Water smooth,
Just to soothe
Sleepy fish.

Dahlov Ipcar

Preface

It's a Fishy Business - But It's an Important One!

Economics and business are important subjects, and it is important that students master some of the basic concepts associated with these disciplines. However, it is probably even more important how students are taught these concepts. The Indiana Department of Education believes that one of the most effective ways to teach economics and business and, likewise, other important content areas is using thematic units of instruction. In these units of instruction students study a major content area, but in doing so, study and master the skills in many other subject areas. The primary content area is the focal point of a much broader scope of instruction.

Why is it important for teachers to use thematic units like "Fishy Business?" It is important for several reasons.

First, it greatly increases student motivation. Students who are genuinely interested in what they are doing in school will learn. One educator put it very bluntly: "People who are highly motivated seldom do . . . without effective student motivation, nothing else matters much."

A second reason is that thematic teaching units help students understand the linkages that exist among subjects. They begin to see learning as an integrated process, instead of the study of distinct subjects which never seem to relate to one another.

Third, students begin to see a reason for mastering the basic skills. Students learn that skills are not to be mastered merely for their own sake, but because the skills are necessary to perform more complex tasks. Students learn that skills are not an end in themselves, but are a means to even greater ends.

A fourth reason is that thematic teaching units lend themselves easily to the use of community resources and other resources. Community people who have expertise in the theme being studied usually are very willing to share their expertise with students. Students also learn how to research other sources of information and to use this information to accomplish tasks. Students become more independent learners and less dependent on the teacher as the sole source of information.

Finally, teaching this way is just plain fun. Teachers become truly excited about teaching when they see their students motivated and learning on their own.

True, the focus of "Fishy Business" is business and economics, but the integrated nature of the instruction lends itself to the mastery of skills in virtually all areas of the curriculum. The Indiana Department of Education hopes that you and your students "profit" greatly from using this thematic teaching unit.

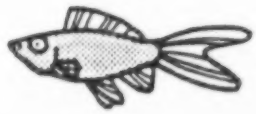
1. G. L. Bach, "What Should a Principles Course in Economics Be," in *Goals and Objectives of the Introductory College-Level Course in Economics*, pp. 15-18. Edited by Allen Larsen and Andrew T. Nappi. Federal Reserve Bank of Minneapolis, 1979.

Fishy Business

Major Goal

The goal of this teaching unit is to use a student operated aquarium business as the focal point for learning economics, language arts, mathematics, fine arts, social studies, and science skills.

Activity 1: Creating Interest in Aquariums



Proficiency/Indicators:

Science Use the five senses to gather and collect data.

Language Arts Write for different audiences and purposes.

Understand structure of language (adjectives and nouns).

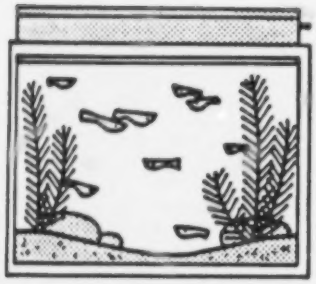
Participate in group discussions (oral expression).

Fine Arts Create with a variety of two- or three-dimensional media.

Materials: Two homemade aquariums, each with different physical characteristics, and each with different combinations of male and female fish. Guppies, platies, and goldfish work well.

Directions:

1. Divide students into groups of three. Tell them to observe the aquariums carefully, describing what they see on observation sheets. Students record differences and similarities, especially among the fish, and then discuss their findings with the class.



2. On their observation sheets, students will circle all adjectives and underline all nouns. Hand in observation sheets.
3. Students will diagram or make a collage of the aquariums.
4. Repeat this activity one month later. Students should note the many changes they observe, such as the yellowing of plants, the appearance of snails or baby fish.

Activity 2: Constructing an Aquarium

Proficiency/Indicators:

Reading Develop independent reading strategies (comprehension).

Gather and analyze information.

Language Arts Write for different audiences and purposes.

Fine Arts Create with a variety of two-dimensional media.

Materials: Glass gallon jars, rocks, aquarium gravel, water plants, dechlorinated water, and fish

Directions:

1. Demonstrate how to make an aquarium. Build the aquarium, explaining each step carefully. The basic steps are listed below. Consult books for more complete details.

   a. Get a one gallon glass jar. The jars are used for mayonnaise and pickles and can be found at most restaurants. Carefully clean the glass jar. Under no circumstance use any type of soap.

   b. Put dechlorinated water into jar up to the point where the neck begins to narrow. To dechlorinate, let the water stand for several days. Water should be at room temperature. The best temperature for tropical fish is about 75 degrees, although a somewhat cooler temperature will usually work. The best temperature for goldfish is 65-70 degrees.

   c. Add aquarium gravel, rocks, marbles, etc. It takes about 1 1/4 pounds of gravel per aquarium. Rinse the gravel thoroughly several times. Avoid shells since they contain lime. Do not use many small rocks or marbles since these make cleaning the aquarium difficult.

   d. Add plants. Ask your local pet/aquarium store owner which types are best for your situation.

   e. Add fish. First float the clear plastic bag containing the fish in the aquarium water for about 45 minutes. This gradually equalizes water temperatures.

2. Discuss this sequence with the class. Could the sequence be altered? Are there other steps that could be added?

3. For an assignment, students must draw a picture and write a summary of each step in the sequence.

4. Have students read many of the available books which describe how to set up an aquarium. Students must note and write any different techniques they discover. Report findings to the class.

5. Have students collect aquarium materials. Each group will construct one aquarium and explain the specific construction techniques to the class.

Activity 3: Introducing the Student Business

Proficiency/Indicator:

Mathematics Collect, organize, and interpret data; predict from data using graphs.

Compute with whole numbers.

Economic Concepts: Scarcity, Law of Demand

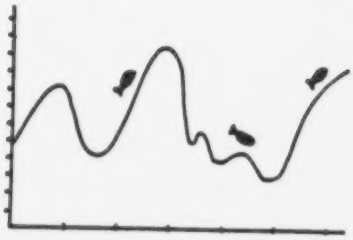
Materials: Graphing paper, market survey sheet (Form 1)

Directions:

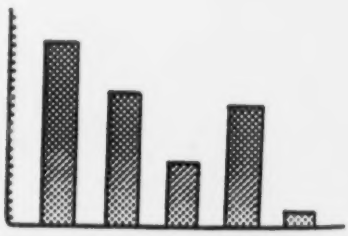
1. Ask students how much they would be willing to pay for an aquarium like the one they made. Discuss. Introduce the idea of scarcity. (In economics, any good is considered scarce if the want for the good is greater than the availability at a zero price.) Explain that individuals will pay for goods that are scarce.

2. To introduce the idea of a fish business to your class, ask the students if they think others would like to buy an aquarium. How much would they pay? Could we make a profit? Would it be worth our time? How would you find out?

3. Explain a market survey to the students. Show examples and explain. In the sample market survey, Figure 1, people will buy five aquariums at a price of $6, eight at a price of $5, 12 at a price of $4, etc. Use sample market surveys to review math and graphing skills. (At what price will we sell the most? How much would we make if we sold the aquariums for $6, for $5?)



4. Have students conduct a market survey. Use Form 1, Market Survey Data Collection Form, to help you. Graph the market survey data as a demand curve (see Figure 2). Discuss and analyze the data with your students.



Activity 4: Counting the Costs

Proficiency/Indicators:

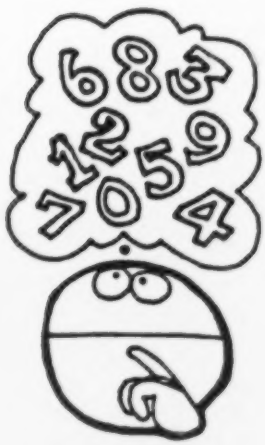
Mathematics
- Compute with whole numbers.
- Develop problem-solving strategies.

Language Arts
- Write a paragraph expressing an opinion.

Social Studies
- Identify economic resources in the community.
- Give examples of how people make choices about using resources.
- Identify the opportunity cost of various choices.

Economic Concepts: productive resources, opportunity cost, profit

Directions:



1. Remind students that before we can start a business, we must know how much it costs to make an aquarium. The key question to answer is, "Will the price we can get cover the cost of production?"

2. Introduce the concepts of productive resources. These are the factors necessary for any type of production to take place: Land (including all natural resources), labor (human work effort), and capital (buildings, tools, and equipment). Pass out Form 2 and have students list all the productive resources they would need to produce aquariums.

3. As a class, use Form 3 to estimate the costs of these resources. There will be no cost for some of them since they can be borrowed or used free of charge (eg., the school building, water). Compute the cost of producing one aquarium. Compare this with the data gathered on the market survey to see how much, if any, profit could be made.

4. Armed with this data, your students now can decide if they should go into business. First discuss the concept of opportunity cost. Opportunity cost is your best foregone alternative when you make a decision. What other worthwhile activities could the class be doing with the time it takes to run a business? What is the opportunity cost of starting a business? (The next best alternative, i.e., what the class would be doing if it did not start a business.)

5. Ask each student to write a short essay on why the class should or should not go into business. In their essays, students must support their point of view with facts and must use the concept of opportunity cost.

Activity 5: Organizing the Business

Proficiency/Indicator:

Social Studies Use relevant data to make decisions.

Explore the education or training needed for a job or profession.

Economic Concepts: manager, employee, sole proprietorship, partnership, corporation

Directions:

1. Discuss the differences between managers and workers in a business. Identify key managers needed in the aquarium business.

Personnel Manager - responsible for hiring and firing employees

Finance Manager - responsible for accounting and all money matters

Production Manager - responsible for producing the product

Marketing Manager - responsible for advertising, promotion, and sales

You also may wish to select a president of the business. Another possibility is to have a manager for Research and Development.

2. Discuss the leadership qualities and other skills needed for these positions. Choose or elect managers to fill these positions.

3. Discuss the different types of business ownership: sole proprietorship, partnership, and corporation. Discuss which type would be best for the guppy business (probably the corporation). Invite a local attorney to discuss how business incorporation takes place. Incorporate your business, which includes choosing a company name.

4. The managers should meet from time to time to discuss the business and to make any important decisions. Someone should take minutes, copy them, and distribute them to the class.

Activity 6: Financing the Business

Proficiency/Indicators:

Mathematics Compute with whole numbers.

Language Arts Write for different purposes and audiences.

Use a variety of forms and use acceptable forms of written English at the "publication" stage of writing.

Economic Concepts: stock, loan, savings, interest, dividends

Directions:

1. Discuss the three basic ways that businesses raise funds for financing operations.

   Stock issues - individuals buy shares, which represent ownership in the business. Shareholders often receive dividends from profits.

   Loans - businesses can borrow from a bank or from another person. The loan must be repaid with interest.

   Savings - prior personal or business savings can be used.

2. Decide how to raise funds to finance your fish business.

3. Next, students should write a brief business plan explaining how their business will operate. Students will present this plan to prospective investors or to the loan officer at the bank.

4. Raise the funds. If you issue stock, let the students design the stock certificates.

Activity 7: Choosing Jobs

Proficiency/Indicators:

Language Arts Writing for different purposes and audiences.

Use a variety of forms and use acceptable forms of written English at the final stage of writing.

Social Studies Explain why people specialize in different jobs.

Describe how people work in jobs to provide goods and services to the community.

Economic Concepts: specialization, human capital

Directions:

1. Brainstorm the different types of jobs (labor) needed to produce aquariums. Discuss the different skills needed for each. Stress that people specialize in doing different types of work because of different interests and abilities.

2. Teach what a resume is. Bring an example. Teach how to make a resume. Have students create their own resumes.

3. The Personnel Manager should list available jobs. The job listings should include the necessary job qualifications.

4. Have students submit a job application for one or several of the jobs in the business. Students should try to match skills and interests with the jobs. Attach resumes. Stress correctness in grammar, writing, and spelling.

5. Job applicants can interview for the positions. Discuss interview skills. This is an excellent time to have a personnel person from a local business speak to the class. This person can conduct practice interviews with the students.

Activity 8: Setting a Price

Proficiency/Indicators:

Mathematics Compute with whole numbers.

Social Studies Use relevant data to make decisions.

Explain how economic decisions are made in a market economy by demonstrating the relationship among factors such as price, supply, and demand.

Economic Concepts: profit, revenues, costs, shortage, surplus

Materials: Data collected from market survey, data from cost worksheet

Directions:

1. Before taking orders for aquariums, have students determine a price. They must analyze revenue data (from the market survey) and cost data (from the cost worksheet). Typically businesses choose prices that will yield the most profit.

2. Discuss what will happen if students set a price that is too high (surplus) or a price that is too low (shortage).

Activity 9: Advertising and Collecting Orders

Proficiency/Indicators:

Social Studies Collect and use relevant data to make decisions.

Language Arts (Oral) Adapt oral language to particular audiences, situations, and purposes.

Write for different purposes and audiences.

Fine Arts Create with a variety of two- and three-dimensional media.

Economic Concepts: Demand

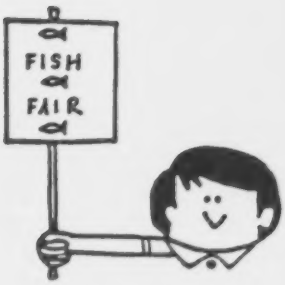
Materials: Student-designed forms for collecting orders, advertising signs for promotions

Directions:

1. The Marketing Manager organizes the advertising efforts. Encourage students to be creative. Discuss the purpose of advertising (to increase consumer demand). Discuss ethical issues concerning advertising.

2. Discuss how to give a successful sales presentation. Invite a salesperson to speak to the class and help them with their presentations. Divide students into groups to practice presentations.

3. Student salespersons should collect orders on student-designed customized order forms. Let buyers choose the color of gravel, kinds of fish, types of plants, whether they want rocks or marbles, etc.



4. Students can also organize an attractive display in the school building for taking orders. For the display, students can prepare three-dimensional clay models of each kind of fish, with each model having a paragraph describing the characteristics of the fish.

   Preprepared aquariums can be sold at the display, probably for a lower price than custom orders. Based on data collected from customized orders, students can determine what preprepared aquariums would be most popular.

5. Salespersons give completed orders to the production department.

Activity 10: Producing the Aquariums

Proficiency/Indicators:

Social Studies
- Describe how people work in jobs to provide goods and services in the community.
- Explain why people specialize in different jobs.

Math
- Compute using whole numbers.
- Compute using ratios.
- Collect, organize, display, and interpret data.

Language Arts
- Engage in a process that includes prewriting, drafting, peer sharing, revising, editing, and publishing.
- Write for different purposes and audiences, using a variety of forms.
- Use acceptable forms of written English at the "publication" stage of writing.

Science
- Identify relationships between independent and dependent variables.
- Predict how the changing of one factor can alter the environment.

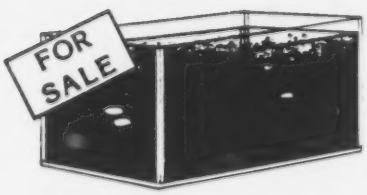
Fine Arts
- Create with a variety of two-dimensional media.

Materials: Gather all the materials necessary to produce aquariums.

Economic Concepts: specialization, division of labor, unit production, interdependence, productivity

Directions:

1. The production team must gather all the materials. The team should research the best prices in town. Inquire at various pet shops and negotiate the best price, especially on the fish. Fish prices can vary substantially. It is very important to buy healthy fish, even if they cost more.



2. If this project involves breeding of fish, "production" is an ongoing process. Divide the class into "research and development" teams, each responsible for breeding a certain kind of fish. Require each team to conduct experiments using their breeding aquariums. For example, students could conduct controlled experiments that analyze which food causes the quickest growth, which light conditions are best for plants, which kind of fish is

the most hardy, etc. This information can be used to improve the finished product. The information also can be used when compiling the "How to Care for Your Fish" booklet that is given to each customer.

3. The Production Manager organizes the production process. To increase productivity, an assembly line may be used. Workers divide the labor by specializing in certain jobs. The Manager and workers should analyze the productivity of the production process at "team meetings." How many aquariums can we produce in an hour or in a day? How does specializing help our productivity? How can it hurt productivity? (If key personnel are absent!) How can we further increase our productivity?

4. Use student suggestions to modify the production process to increase productivity. Production workers should make a presentation to the class explaining productivity and how they increased productivity. Prepare graphs and charts to use in the presentation.

5. Production workers may become bored with their assembly line jobs. They may wish to produce complete aquariums (unit production). This will probably reduce productivity, but may result in more job satisfaction for workers. Discuss this issue with the class.

6. One production team must compile a "How to Care for Your New Fish" booklet that is given to each customer. You may wish to write the text on the computer and, then, add illustrations and pictures. This aspect of production will create several jobs and will require a fair amount of research using library resources.

Activity 11: Compute Profits

Proficiency/Indicators:

Mathematics
- Develop problem-solving strategies.
- Compute using whole numbers.
- Compute using percents (optional).
- Collect, organize, display, and interpret data.

Language Arts
- Adapt oral language to particular audiences, situations, and purposes.

Fine Arts
- Create with a variety of two-dimensional media.

Materials: Cardboard, colored markers

Economic Concepts: profit, cost, sales revenues

Directions:

1. The Financial Manager and his accountants should compute profits. Form 3 - Cost Worksheet, Form 4 - Sales Revenues, and Form 5 - Profit Worksheet should be helpful
2. The Financial Manager and his accountants should prepare a financial report to present to the class. The presentation should include charts, pie graphs, etc., showing profits, costs, sales revenues, and other pertinent data.
3. Prepare math word problems using fictional cost and sales revenue data. Students must compute profits. Or, students can create their own problems and give them to classmates to compute.
4. Older or more advanced students can compute percents. For example, profits were what percentage of sales? What percentage was the mark-up on individual aquariums? What percent of our sales were from custom orders?

Activity 12: Deciding How to Use Profits

Proficiency/Indicators:

Mathematics Compute using percents.

Social Studies Use relevant data to make decisions.

Give examples of how economic resources are limited (scarcity), and how people must make choices on how to use resources.

Identify the opportunity cost of various choices.

Language Arts Write for different purposes and audiences.

Materials: "Malcolm Decides" video program from the *Trade-Offs* series

Economic Concepts: scarcity, opportunity cost, dividends

Directions:

1. Use Form 6 - Balance Sheet or a similar form to compute the amount of money the class has left to use.

2. Explain how the concept of scarcity relates to the decision on how to use the money earned from the business. There is a limited amount of money, but many uses for it! The class must decide how to use these scarce funds. Emphasize that there will be an opportunity cost to their decision - the best alternative use for the funds that is not chosen.

3. You can use use various decision-making techniques and models in this situation. A favorite is the five step model presented in "Malcolm Decides," a video program from the popular *Trade-Offs* series. It is available from the Indiana Council for Economic Education and its affiliated university centers of economic education.

Activity 13: Publishing an Annual Report

Proficiency/Indicators:

Language Arts Engage in a process that includes prewriting, drafting revising, editing, and publishing.

Write for different audiences, use appropriate forms of written English at the "publication" stage of writing.

Fine Arts Create with a variety of two-dimensional media.

Materials: Paper, film, and any other materials necessary for publishing the report

Directions:

1. The class should publish an annual report. The report highlights the important events that took place in your guppy business. Include a message from the president/ managers, summary of business highlights, photos, testimonials, all financial data, and any other appropriate information.

2. Students should also discuss things they would do differently if they repeated the business. Record these and prepare a report for the next year's class.

Practical Considerations:

1. Involve other teachers in a class business project. Instead of aquariums, sell some other product.

2. Consider expanding your project into a school fair or bazaar. Each classroom can form a business and operate a store on the day of the fair. Several school corporations in Indiana have done this. Technical assistance is available from the Indiana Department of Education. See Comment 9 below.

3. Do not forget to get media coverage of your business. Local newspapers and television stations are usually very interested in these types of projects.

4. Ask parents what they thought about the business project. Send home a simple evaluation form for them to complete. Ask for suggestions for improving next year's project.

5. Try to present your project to other teachers in workshops or inservice settings. This is one reason to take slides of your project activities.

6. Intermediate teachers who do this or another business project during the regular school year may wish to use the Business Basics Program from Junior Achievement. This four session enrichment program uses discussion, role-playing, and hands-on activities to introduce students to basic business concepts. For more information, contact the Junior Achievement office in your region.

7. To gain a better understanding of economics, attend an economics education summer workshop which are held at universities throughout Indiana. There is normally no cost to you for tuition, and participants earn up to three hours of graduate credit. For more information, contact the Indiana Council for Economic Education, Krannert Center, Purdue University, West Lafayette, IN 47907, (317) 494-8541.

8. Consider submitting your business or other economic education project to the Olin Davis Awards Program for Exemplary Teaching of Economics in Indiana. Cash awards are given. For more information, contact the Indiana Council for Economic Education at the address in Comment 7.

9. Grant monies are available on a competitive basis through the Indiana Department of Education for public school teachers who wish to initiate or expand economic education programs. For more information about the Economic Education Mini-Grant program, contact the consultants listed below. They serve educators on a regional basis and will answer any questions you may have about economic education.

Northern

Harlan R. Day
Krannert Center
Purdue University
West Lafayette, IN 47907
(317) 494-8542

Southern

David Ballard
Wilson Education Center
630 Meigs Avenue
Jeffersonville, IN 47130
(812) 288-4825

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Resources for Fishy Business

Ipcar, Dahlov, *Fishes' Evening Song.*

McIntosh and Otis, Alfred A. Knopf, *Whales Perform and Other Things*, Copyright 1967.

FISHY BUSINESS
Applying Ecomomics

Aquariums

Organizing the Business

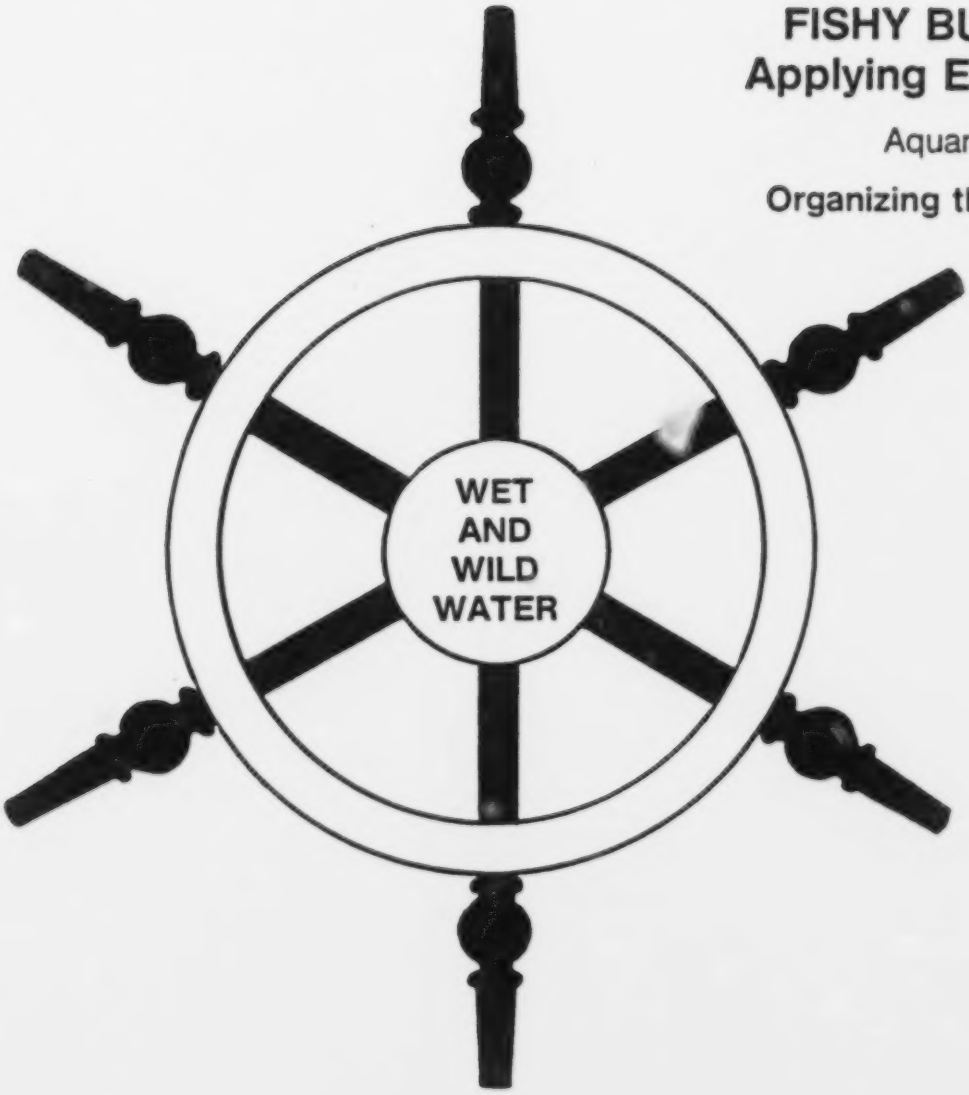


Figure 1

SAMPLE MARKET SURVEY DATA COLLECTION FORM

Price	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	TOTAL
$6.00	0	1	1	2	0	1	5
$5.00	0	2	1	2	1	2	8
$4.00	1	2	2	2	2	3	12
$3.00	2	3	2	3	3	4	17
$2.00	3	5	3	4	5	6	26
$1.00	4	7	5	6	7	8	37

1. At what price will we sell the most aquariums? $1.00
   The fewest? $5.00
2. At which price will we earn the most revenues? $2.00
   ($2.00 x 26 = $52.00)
3. Can we produce the aquariums we need at the price in 2. above? _____
4. If not, how many aquariums should we produce? _____ What price should we charge? _____

Figure 2

DEMAND CURVE OF MARKET SURVEY DATA

Price									
$6.00									
$5.00									
$4.00									
$3.00									
$2.00									
$1.00									
	5	10	15	20	25	30	35	40	45

Quantity People Will Buy

Form 1

MARKET SURVEY DATA COLLECTION FORM

Our class is conducting a market survey to gather information about the product our class is planning to sell. Could you please provide us with some information.
How many _____ would you buy if the price were _____? (ask each price)

Price	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Total

Form 2

IDENTIFYING THE PRODUCTIVE RESOURCES NEEDED TO MAKE AN AQUARIUM

NATURAL RESOURCES (Land)	HUMAN RESOURCES (Labor)	CAPITAL RESOURCES (Tools, Equipment, etc.)

Form 3

PRODUCT COST COMPUTATION SHEET

Our cost estimate will assume we are producing _____ aquariums.

	Quantity	Unit Cost	Total Cost Quantity x Unit Cost
Natural Resources (Land)			
Labor Resources (Labor)			
Capital Resources			
Other			

TOTAL	
Interest paid on loan	
Grand Total	

Form 4

SALES REVENUES

Type of Aquarium	Price	Quantity Sold	Sales Revenues
		Sales Revenues from all aquariums	

Form 5

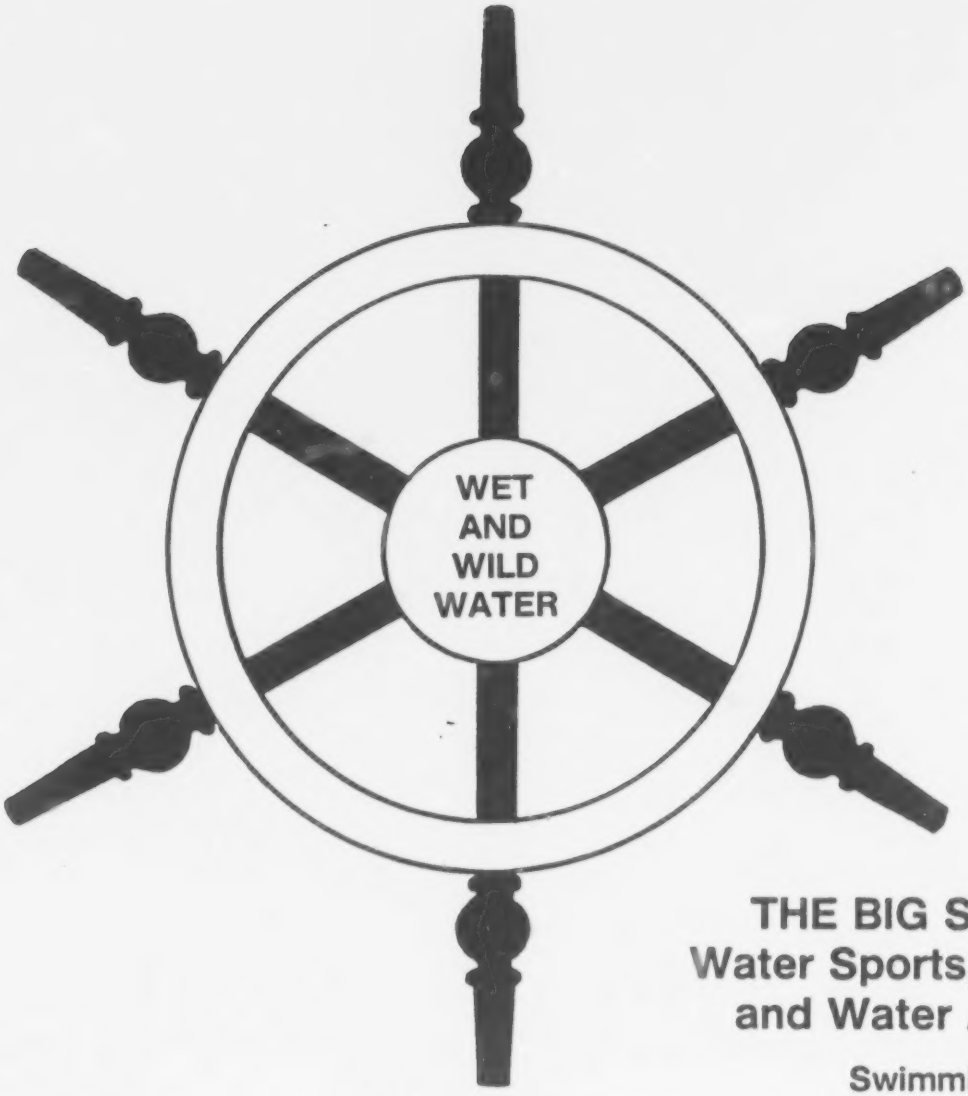
PROFIT WORKSHEET

Total Sales Revenues (from Form 4)	
Total Costs (use Form 3)	
Before Tax Profit	
Tax on Profits	
After Tax Profit	

Form 6

BALANCE SHEET

Total Cash on Hand (from profits, stock sales, loan, etc.)	
Distributions	
Paid to Stockholders (including dividends)	
Paid to Bank, Including Interest	
Saved for Next Year's Business	
Gift to School or Charity	
Other Distributions, if any	
TOTAL DISTRIBUTIONS	
AMOUNT LEFT FOR CLASS TO USE	
MINUS	
TOTAL CASH ON HAND	
TOTAL DISTRIBUTIONS FOR CLASS TO USE	



THE BIG SPLASH
Water Sports, Athletes, and Water Animals

Swimming

Fishing

Excerpt from
THE OLD SWIMMIN' HOLE

. . . Oh! the old swimmin'-hole! In the happy ays of yore,
When I ust to lean above it on the old sicamore,
Oh! it showed me a face in its warm sunny tide
That gazed back at me so gay and glorified,
It made me love myself, as I leaped to caress
My shadder smilin' up at me with sich tenderness,
But them days is past and gone, and old Time's tuck his toll
From the old man come back to the old swimmin'-hole . . .

James Whitcomb Riley

THE BIG SPLASH
Water Sports, Athletes, and Water Animals

Introduction

Man has always found enjoyment and peace being around water. Swimming and fishing are two of the most popular water recreational activities in our country.

In this section, the topics of swimming and fishing are investigated. We encourage you to extend this study to include literature books dealing with animals that live in the water. You can find book resource information at the end of "The Big Splash" section.

CORE KNOWLEDGE
Swimming Information for the Teacher

Swimming is the act of moving through water by using the arms and legs. Ancient people may have learned how to swim by imitating the way dogs and other animals moved through water.

It is a popular form of recreation, an important international sport, and a healthful exercise. Swimming improves heart action, aids blood circulation, and helps develop firm muscles.

People of all ages can enjoy swimming. Good swimmers may also participate in a wide variety of water sports, including diving, surfing, water skiing, water polo, scuba diving, and synchronized swimming.

Swimmers use four basic types of kicks: the flutter kick, the breaststroke kick, the dolphin kick, and the scissors kick.

There are five basic types of strokes: the front crawl, the backstroke, the breaststroke, the butterfly, and the sidestroke.

Olympic Motto = Citius, Aaltius, Fortius = Swifter, Higher, Stronger

Olympic Creed: "The most significant thing in the Olympic Games is not to win but to take part. Just as the most important thing in life is not to triumph but the struggle. The essential thing is not to have conquered but to have fought well."

Janet Evans is one of the top swimmers in the world. She began swimming when she was about one year old. Janet says, "To be a good swimmer, you have to work out, but enjoy it," Janet is 18 years old, 5 feet 4 inches, and weighs 105 pounds. Below is Janet's schedule when she is in school:

Monday - Friday

		4:45 a.m.	Wake up
5:15	-	7:00 a.m.	Workout
7:55	-	1:45 p.m.	School
1:45	-	3:30 p.m.	Lift weights or do homework
3:30	-	6:00 p.m.	Workout
6:30	-	8:30 p.m.	Eat dinner and do homework
		8:30 p.m.	Bed

Saturday

Morning:	Workout
Afternoon:	Free

Sunday

Day Off

Swimmers train hundreds of hours to shave tenths of a second from a record. Practices are monotonous as swimmers log lap after lap. Swimmers experiment with starting techniques:

jackknife start - diving deep off blocks

track start - crouching like runners and flinging themselves forward

Some swimmers shave their bodies and heads to reduce friction.

MARK SPITZ

Mark Spitz was the first person to win seven gold medals in one Olympics. He did this in 1972 at the games in Munich. He was victorious in the 100- and 200-meter freestyle and butterfly events and was a member of three winning relay teams. This climax to his career is why he is considered the best swimmer of his time and one of the greatest ever.

Spitz had his first swimming lesson when he was eight years old. From the beginning, he was encouraged by his father to think only of winning. At Indiana University, he led the swim team to four national championships, winning eight events himself. At the Pan American Games in 1967, he won five races. At the Olympic Games in Mexico City in 1968, he was a disappointment to himself and others when he won only a single bronze medal.

Spitz retired after the 1972 Olympics, by which time he had set a total of 23 world and 35 United States records. He is now preparing for the 1992 Barcelona Olympics. He has set his sights on the 100-meter butterfly, his favorite event, in an attempt to win his 10th gold medal.

DON SCHOLLANDER

Don Schollander was the first swimmer ever to win four gold medals at one Olympics. He achieved this in 1964 at Tokyo, where he won the 100- and 400-meter freestyle races and was a member of the 400- and 800-meter relay teams. In the 400-meter freestyle, he set a world record of 4 minutes, 12.2 seconds.

Schollander began swimming when he was nine years old and, at 15, went to the Santa Clara, California, Swim Club for expert coaching. A year later, in April 1962, he set his first United States record, 4 minutes, 18.3 seconds, in the 440-yard freestyle. In July 1963, he became the first to swim the 200-meter in under two minutes with a mark of 1:58. He later reduced his time for this event to 1:54.3. In all, between July 1967 and August 1968, Schollander set nine new records.

During most of Schollander's victorious career, he was a student at Yale and was the 100-yard intercollegiate champion in 1968. At the Pan American Games of 1967, he won the 200-meter event, but was less successful at the 1968 Olympics, where he qualified only for the 200-meter freestyle and did not win the gold.

Schollander trained for perfection, and his effortless crawl style contributed to his speed.

GERTRUDE EDERLE

Gertrude Ederle made the front pages of the world's newspapers on August 7, 1926. The day before, she had become the first woman to swim the English Channel, in a time nearly two hours better than the previous record. Swimming from France to England, she had accomplished the feat in 14 hours, 31 minutes. Her record stood until 1964, when it was broken by another woman, Greta Andersen of Denmark.

Ederle, in 1925, had tried and failed to swim the Channel, but that same year, she swam from the Battery in New York harbor to Sandy Hook, New Jersey. On her return from her Channel triumph, Ederle was honored by a large and noisy ticker tape parade in New York City.

Long before the Channel swim, Ederle had been breaking records. On September 4, 1922, when Ederle was only 15, she set six world records in one day, from 300 to 500 yards and 400 meters. Again in one day, September 3, 1923, she set United States records for seven distances, from 100 to 500 yards and 300 meters. At the 1924 Olympics in Paris, Ederle won two bronze medals, in the 100- and 400-meter freestyle, and a gold medal as a member of the 400-meter relay.

Swimming made Ederle deaf, and she suffered a back injury in 1933 that kept her in a cast for four years. Nevertheless, she made a comeback and appeared in Billy Rose's "Aquacade" at the New York World's Fair in 1939. She later taught swimming to deaf children.

JOHNNY WEISSMULLER

Although an Associated Press poll in 1950 voted Johnny Weissmuller the greatest swimmer of the first half of the century, today, he is remembered as the man who starred in the movies as Tarzan.

Weissmuller certainly was the dominant swimmer of the 1920s. Weissmuller's swimming style, described as "a high-riding front crawl stoke," was revolutionary at the time. Between 1921 and 1928, he won 20 American championships in distances from 100 to 440 yards. On June 23, 1922, for example, he broke four world records in one meet - in the 300- and 400-meter and the 440- and 500-yard races.

In the 1924 Olympics in France, Weissmuller won the 100-meter freestyle in what was then a record time of 59 seconds and the 400-meter in 5 minutes, 4.2 seconds, also a record. At the 1928 Olympics, he again won the 100-meter in a new best time of 58.6 seconds.

Weissmuller retired after the 1928 Olympics. In all, he won 52 American championships and set 67 world records. Between 1932 and 1948, he played Tarzan in 19 movies and created the famous yodeling call that generations of small boys imitated.

Water Safety

Approximately 9,000 people drown every year in the United States due to inadequate water safety knowledge. The following are some basic rules and techniques that could save your life or the life of another person.

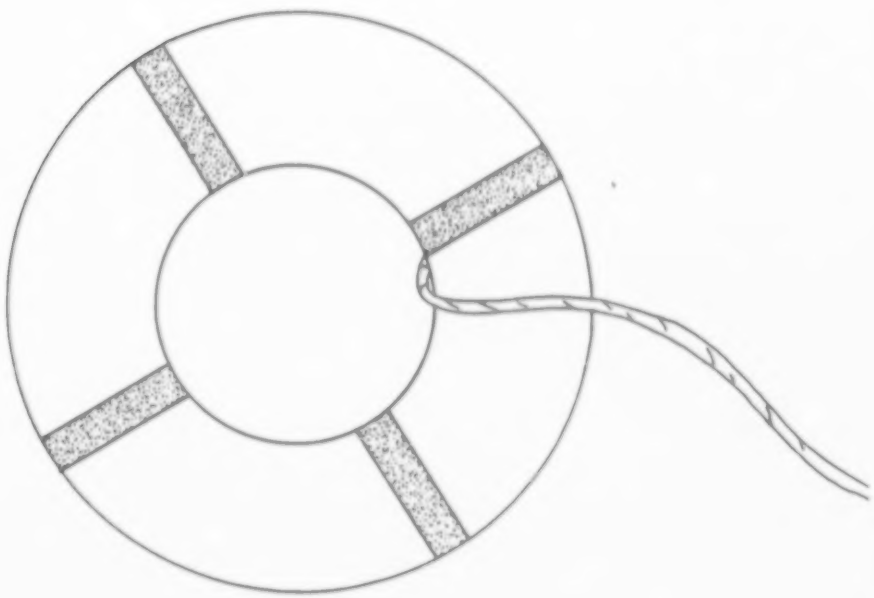
A. Learn how to swim.

B. Never swim alone and swim only in areas where a lifeguard is on duty.

C. Never dive in unfamiliar waters.

D. You can help a swimmer in distress by extending a board, pole, towel, shirt, etc., and pull the swimmer to safety.

E. Take a water safety program offered by an organization in your community.



Activities for
The Study of Swimming

Activity 1: Mark Spitz - Here I Go Again.

Proficiency/Indicator:

Mathematics Demonstrate computational skills with whole numbers.

Collect, organize, display, and interpret data.

Information: Mark Spitz swam 26,000 miles to train for the Munich Olympics. He has 3,600 more miles to swim to get ready for the Barcelona Olympics. In the next three years, he will swim a distance equal to going from Los Angeles to New York and then back to Chicago.

Directions: Write two story problems using the information about Mark Spitz. Work them and be ready to share them with the class. Teacher can duplicate five to ten outstanding ones for everyone to work. Plan a route on the map for a trip that would equal 3,600 miles. Calculate the distances from city to city to equal that distance.

Activity 2: When Fish Fly

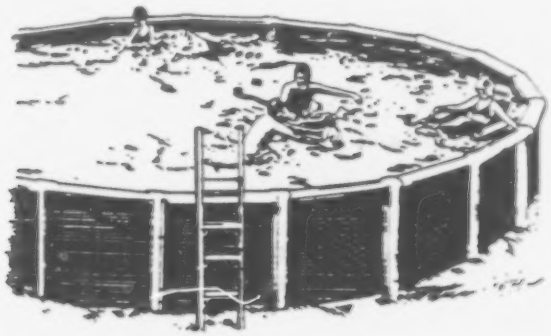
Proficiency/Indicator:

Mathematics Collect, organize, represent, question, interpret, draw conclusions, and predict from data using tables, charts, and graphs.

Information: When Tom Jager (USA) broke the world record for the 50m freestyle with 22.40 seconds at Austin, Texas, in December 1985, he averaged a record 8.03 km/h (4.99 mph) for the distance. That was the greatest speed achieved by a swimmer. Recent records have surpassed this record.

The equivalent speed for a woman was 7.03 km/h (4.37 mph) achieved by Dara Torres (USA) when she set the female record for 50m freestyle at 25.61 seconds at Mission Viejo, California, in July 1984.

By comparison with human beings, the dolphin has been measured at speeds of over 40 km/h (25 mph), but the fastest fish known is the swordfish which has reached speeds estimated at 109 km/h (68 mph).



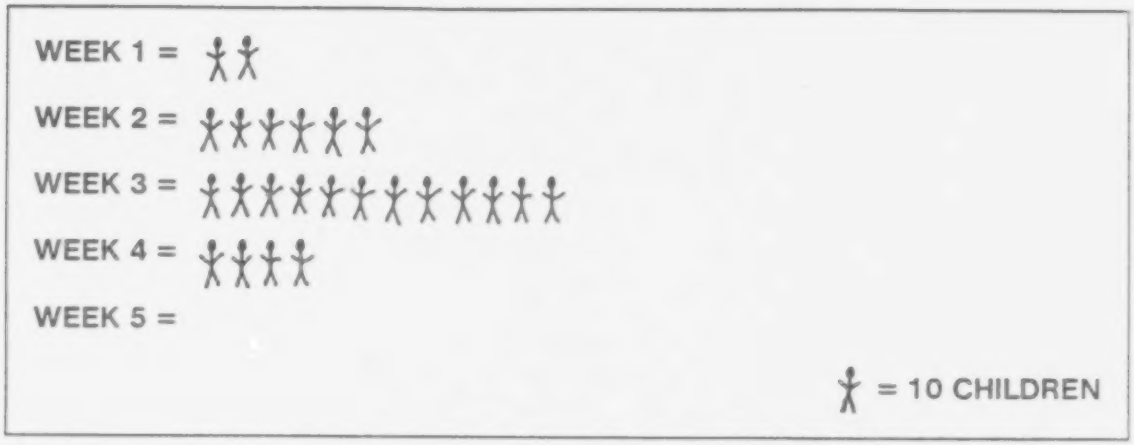
Activity 3: Sizing Up the Pool

Proficiency/Indicator:

Mathematics Estimate and measure using standard and nonstandard units.

Materials: Heavy cardboard, manila folders, colored markers

Directions: Each student will receive two pieces of cardboard - one cut in a one-inch square, another cut in a one-centimeter square. The teacher will provide the student with a file folder containing an outline drawing of a swimming pool. File folders will contain different pool shapes. The file folders or pools need to be numbered or may be named after a local pool located in the community. Examples of different pool shapes are provided. Have the students use the two cardboard squares to measure the size of the pools. How many squares does it take to fill a particular pool? You may wish to have students work in small groups to complete this activity. Ask the students; Which cardboard square is larger? Which pool is larger? Smaller? They may also rank them from largest to smallest.



Activity 4: Big Wave Swimming Pool

Proficiency/Indicator:

Mathematics Collect, organize, display, and interpret data.

Materials: Big Wave Community Swimming Pool Phictograh

Directions: Distribute the phictograph worksheet which is included in this packet. Have the students answer the questions provided concerning how many children visited the local swimming pool during a five-week period.

Using the phictograph above, answer the questions.

1. How many children visited the pool in Week 4? _____
2. How many children visited the pool in Week 2? _____
3. In what week did the largest number of children visit the pool? _____
4. In Week 5, 80 people visited the pool. How would you draw this on the graph?

   _____

5. Each child paid $1.00 to get in the pool. Fred visited the pool each Wednesday during the five weeks. How much money did he spend? _____

Activity 5: The Two Frogs

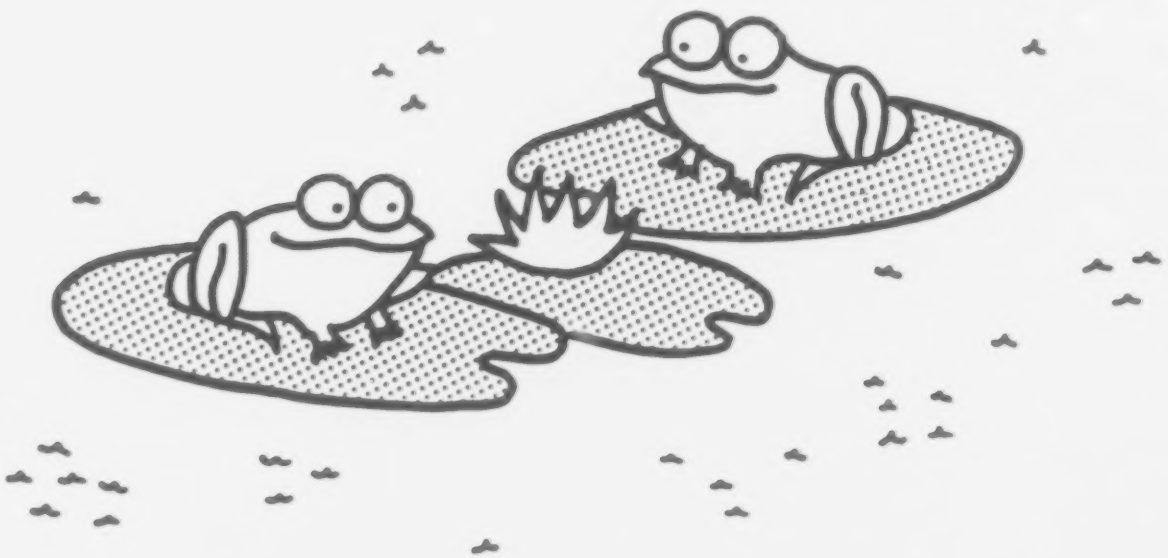
Proficiency/Indicator:

Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: The play, "Two Frogs"
Author unknown

Directions: Divide the class into pairs. Let them read the play together and share it with another pair.

Extended Activity: Make finger puppets or stick puppets.



A TALE OF TWO FROGS

Characters: First Frog, Second Frog

Setting: A very, very hot summer day. The two frogs are hopping along a very, very, dusty road.

First Frog: We have been hopping along all day, and I don't think we will ever find water! Every pond is all dried up!

Second Frog: Don't get discouraged! After all, this has been a very dry summer. Of course, it will take some time before we find a nice wet pond. (The two frogs continue hopping down the road.)

First Frog: Look! Look! There's a well! At last our journey is over! (Both frogs jump to the edge of the well.) Let's jump in! It looks so nice and wet!

Second Frog: Wait! Don't jump in!

First Frog: Don't be silly. Why not?

Second Frog: Let's talk about it first.

First Frog: There is nothing to talk about. All day long we have been hopping along this hot road searching for water. Now we have found it, and you say, "Let's talk about it!" I'm going to jump!

Second Frog: Wait a moment!

First Frog: I'm going to jump in the well right now!

Second Frog: Wait! Wait! Yes, the well is full of cool delicious water, but what if the well goes dry just as all the other ponds went dry? We would be in a dreadful situation for we wouldn't be able to get out of the well!

First Frog: Don't be silly! The well isn't going to dry up.

Second Frog: You jump in if that's your decision, but as for me, I'm going to keep hopping along the hot dusty road until I find a cool stream. Good-bye!

Moral: Look before you leap.

Activity 6: Tadpole ⟶ Frog

Proficiency/Indicator:

Mathematics Develop problem-solving strategies.

Materials: Welcome children with tadpoles in an aquarium. Observe and record tadpole development. Give each child a sheet with a frog and lily pad. Read the Book, *No Ducks in Our Bathtub*, by Martha Alexandra

Directions: Write four math problems and answer them to get the frog to the lily pad. Make up two story problems about the frog. Give him a name and write the problems on paper, putting the answers on the back.

(These can be shared and worked by everyone.)

Activity 7: Water Words

Proficiency/Indicator:

Language Arts Use phonetic and structural analysis.

Materials: List of words and definitions for each student

Directions:

1. Discuss words one at a time.
2. Do spelling activities with students.
3. Cut several poster boards into large strips, one strip is needed for each word on the Spelling List. Definitions which have two words may be used as two separate words. Write a word on each strip. Have the students stand in the middle of the room, forming a line by placing the word strips in alphabetical order.

Spelling List:

aggregate time - the time achieved by four swimmers.

backstroke - in competition swimming, an upside-down crawl, with the swimmer using a flutter kick; the arms are alternately extended past the head and pulled to the hips. The elementary backstroke combines the frog kick and the double-arm pull from past the shoulders to the hips.

breaststroke - a swim stroke done in the prone position, combining the frog kick and the double-arm pull, downward and to the side.

butterfly stroke - a stroke performed in the prone position, combining the dolphin kick and the double-overarm pull. The arms and face come out of the water upon recovery.

composite time - in a relay event, the time achieved by four swimmers.

crawl - a stroke that is done in the prone position, combining the flutter kick with alternate arm pulls.

dolphin kick - a kick in which the legs are moved up and down together; used in the butterfly.

flip turn - a turn made by a swimmer at the edge of the pool, comprised of a half-forward somersault and a half-twist underwater before a push with the feet against the pool wall.

flutter kick - a kick in which the legs are alternately moved past each other; used in the backstroke and the crawl.

freestyle - a competition in which a swimmer may use any recognized stroke; the crawl is most commonly used. The terms "freestyle" and "crawl" are often used interchangeably.

frog kick - a kick used with the breast stroke and the elementary backstroke. The knees are brought up almost level with the hips; the feet are kicked out; and the legs are pulled together - all in one continuous movement.

lane - a narrow strip running the length of the pool within which a swimmer must keep throughout a race.

leg - a section of a relay.

long course - a pool at least 50 yards long.

scissors - a kicking motion in which the top of the instep of one foot and the bottom of the other kick alternately, providing propulsion.

short course - a pool at least 25 yards long, but not more than 50 yards long.

split time - the time required to complete half the distance in a long event.

trudgen stroke - a crawl done with a scissor kick.

Spelling Activity Sheet

1. Write all words with double letters.

   a. _____ e. _____

   b. _____ f._____

   c. _____ g. _____

   d. _____ h. _____

2. Circle the double letters.

3. Fill in vowels (a, e, i, o, u)

   a. C R _ W L

   b. F R _ _ S T Y L _

   c. B _ C K S T R _ K _

   d. L _ N E

   e. L _ G

   f. S C I S S _ R _

   g. B R _ S T S T R _ K _

   h. F L _ P T _ R N

4. Write three words that are compound words.

   _____

   _____

   _____

5. Using the swimming spelling words, make up your own crossword puzzle.

Activity 8: The Rain Puddle

Proficiency/Indicator:

Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: Read the book, *The Rain Puddle* by Adelaide Holl. (When farm animals saw their reflections in a rain puddle, they thought everyone had drowned - similar to the falling sky in *Chicken Little* - the wise owl watched it all and laughed.)

Directions: Make up a predictable story about animals and rain. Start a story and go around and have children add to it.

Activity 9: Water Rat

Proficiency/Indicator:

Language Arts Listen and respond for a variety of purposes. Engage in a process that includes prewriting, drafting, peer sharing, revising, editing, and publishing.

Materials: *The Wind in the Willows,* a Simon and Schuster, Inc., Wanderer Book

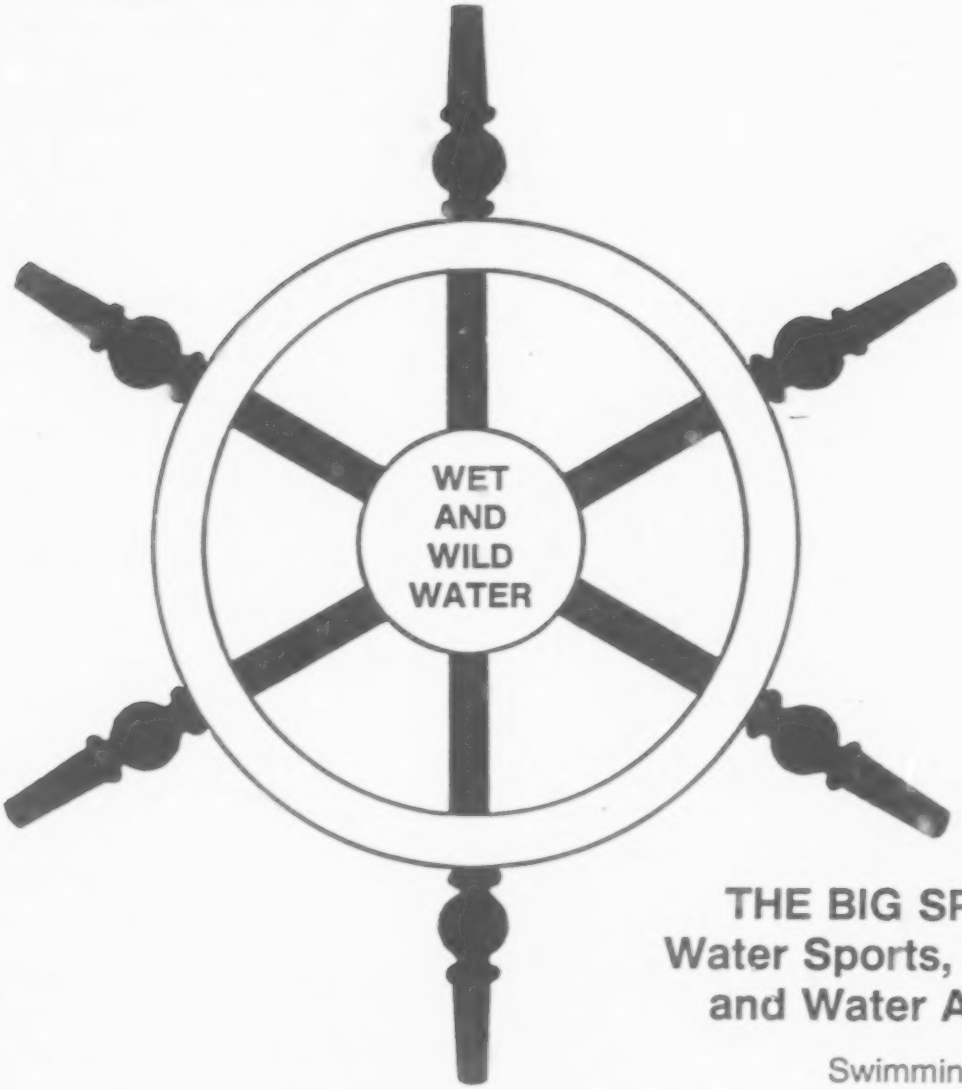
This is an award-winning classic in paperback that every student aged five to ten should know as his or her own.

Directions: Teacher reads the story orally to students. It lends itself to lots of writing activities about boating, swimming, or water activities.

Students write stories about:

When I fell into the water
When I fell out of the boat
When I learned to swim
When I learned how to row
When I almost drowned
How to row a boat.

Students may want to illustrate their stories.



THE BIG SPLASH
Water Sports, Athletes, and Water Animals

Swimming

Fishing

THE FISHING PARTY

Wunst we went a fishin' - Me
An' my Pa an' Ma, all three,
When they wuz a picnic, 'way
Out to Hanch's Woods, one day.
An' they wuz a crick out there,
Where the fishes is, an' where
Little boys 'tain't big an' strong
Better have their folks along.
My Pa he ist fished an' fished!
An' my Ma she said she wished
Me an' her was home an' Pa
Said he wished so worse'n Ma.
Pa said ef you talk, er say
Anything, er sneeze, er play,
Hain't no fish, alive er dead,
Ever go' to bite! he said.
Purt' nigh dark in town when we
Got back home; an' Ma, says she,
Now she'll have a fish fer shore!
An' she buyed one at the store.
Nen at supper, Pa he won't
Eat no fish, an' says he don't
Like 'em-An' he pounded me
When I choked! . . . Ma, didn't he?

James Whitcomb Riley

CORE KNOWLEDGE
Fishing Information for the Teacher

Fishing is a popular form of recreation. You can fish in streams, rivers, lakes, bays, and oceans for many kinds of fish.

People who fish for sport are called anglers. They enjoy the challenge of hooking and landing fish.

Common methods of fishing include, casting, still fishing, drift fishing, trolling, and ice fishing

Casting = the angler casts the lure (artificial bait) into the water and carefully retrieves (gathers in) the line in an attempt to lure the fish to bite.

Still Fishing = the angler throws the line into the water from a bank or anchored boat and waits for a fish to bite.

Drift Fishing = angler trails the bait behind the boat. It drifts freely with the current.

Trolling = bait is trailed behind a moving boat.

Ice Fishing = angler fishes through a hole chopped in the ice.

Fishing Tools

Two basic fishing tools are the rod and reel. Rods are tapered poles made of fiberglass, bamboo, graphite, steel, or other material. Fishing line is strung along the rod. Reels are used to store, release, and retrieve fishing line. The four basic kinds of reels are spinning, spincasting, bait-casting, and fly. A leader is a length of line made of a synthetic or metal material. It is connected to the end of the line and attached to a hook. Sinkers are lead weights that are attached to lines or leaders, they lower the bait and hold it in the water. Floats hold the bait suspended in the water. Floats are also called bobbers. They go under water when the angler gets a strike. Hooks come in many sizes and styles. They depend on the size fish you are trying to catch.

Bait used to catch fish may be either natural or artificial. Natural bait can include small fish, minnows, saltwater herring, mullet, and smelt. Fish also feed on worms, crayfish, grasshoppers, and frogs. Eels, clam worms, and shrimp may be used in saltwater fishing.

Artificial bait consists of items called lures. Basic types of lures include flies, plugs, spinners, and spoons.

Flies = lightweight lures made of feathers and hair. They look like insects or small fish.

Plugs = wooden or plastic lures designed to resemble small fish, frogs, and other natural bait.

Spinners = have metal blades that whirl as the spinner is retrieved through the water. They attract fish by motion and the sound they make.

Spoons = are rounded or dished-out metal lures that flutter when pulled through the water.

Fishing Tips

1. A person learns from experience how to hook and play out (tire) a fish properly.
2. Study habits of the fish to know what bait and fishing technique to use.
3. Temperature of water influences hunger and activity of fish.

Check the United States Department of Agriculture Soil Conservation Service for more information.

Fishing Industry

If you love fishing, you can have a career in fishing. The fishing industry provides food and jobs for millions of people. This include activities involved in the commercial and recreational production of fish and shellfish.

The catching, processing, marketing, and conservation of fish and shellfish are all parts of the industry.

Fish are sold fresh, canned, cured, and frozen. In addition, almost one third of the world's fish catch is used to produce animal feed and various industrial products.

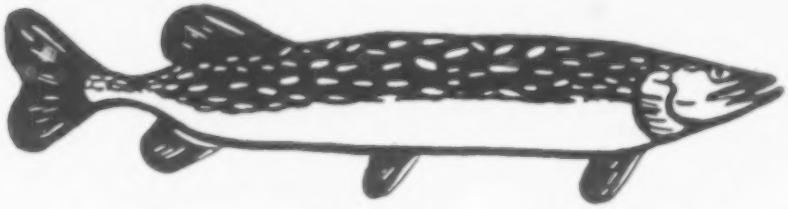
The oceans are the main source of fish. The fishing industry employs more than 6 million people worldwide. People have fished for thousands of years. Most fishing crews harvest most of their catch with huge nets.

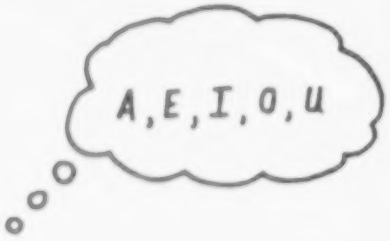
Leading Fishing States

1. Louisiana
2. Alaska
3. Virginia
4. California

Leading Fishing Countries

1. Japan
2. Soviet Union
3. China
4. United States





Activity 10: Fishy Sounds

Proficiency/Indicator:

Science Sort, group or arrange objects, systems, ideas, or events on basis of similarities.

Materials: Fish cards with water vocabulary words written on them

mud	crab	breeze	boat	whale
sub	seal	rope	net	tide
sun	sand	dock	splash	fish
duck	raft	float	wave	shell
sail	sea	ship	wet	wind

Language Arts Large shells, labeled with vowel sounds

Directions: Children can sort the fish cards into vowel sounds. Place the cards under the right shell.

Extended Activity: These may be sorted different ways.

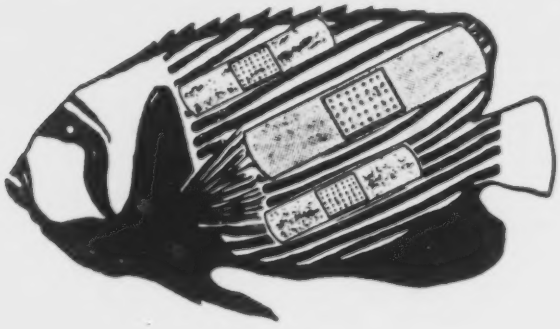
Activity 11: Red Lobster or Long John Silver's

Proficiency/Indicator:

Mathematics Demonstrate computational skills with whole numbers.

Materials: Stop at Red Lobster or Long John Silver's and pick-up a menu to copy or enough copies for the class.

Directions: After working math problems adding up different food and practicing giving change, have the children design their own seafood restaurant menu.



Activity 12: Band-Aid Fish Art

Proficiency/Indicators:

Language Arts Listen and respond for a variety of purposes.

Fine Arts Create with two- and three-dimensional media.

Materials: *BurtDow - The Deep Water Man,* by Robert McCloskey, Puffin Books

This beautifully illustrated paperback is about a fisherman who catches a whale and gets caught by a whale. He finds a way to appease the whale by putting a colorful band-aid on each of the whale's tails, Grades 3-6.

Directions: Teacher reads the book orally to students. Teacher reads or tells the story of *Jonah and the Whale*. Students compare and discuss the two stories. Students draw a fish and then select a band-aid (band-aids supplied by teacher) and use it to decorate, design, etc., the fish. Visit a zoo, pet store, aquarium - observe tropical fish. Students select a tropical fish and draw it on overhead transparency with colorful markers. Present it to the class with a brief informational speech.

Activity 13: Swim for the Gold

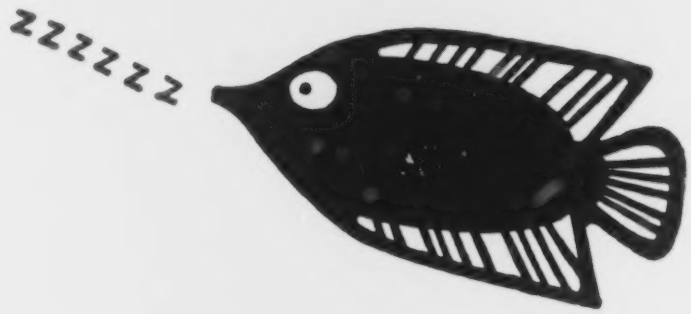
Proficiency/Indicator:

Mathematics Demonstrate computational skills with whole numbers.

Materials: Blue paper on bulletin board/green land; place the fish between the waves (put thumb tacks in, if needed). This could be "swim for the gold," etc.

Directions: Students work the problems at their seats and, then, turn the fish over to check the answers.

Extended Activity: Any math problems



Activity 14: Something's Fishy

Proficiency/Indicator:

Language Arts Write for different purposes and audiences, using a variety of forms.

Materials: A copy of this information and writing paper

- Most fish do sleep with their eyes open.
- Fish swim in schools of up to hundreds of millions for protection from enemies.
- The whale shark, the largest fish, can grow up to 59 feet long. It eats small water animals and plants, not people.
- The fastest fish, the sailfish, can swim at more than 60 miles per hour.
- The pygmy goby is the smallest fish. Adults average one-third inch long.

- Flying fish do not fly, but jump and glide above the water on their large fins.
- One goldfish lived to be 40 years old. Most can live to 17 years, except for goldfish kept in aquariums.
- A seahorse is really a fish that swims in an upright position.
- Sailors once believed in mermaids, beautiful sea maidens who were half human and half fish.

Directions: Use these fishy facts to write a creative story, poem, rap, or book. Illustrate it when you are finished.

Activity 15: The One that Got Away

Proficiency/Indicator:

Language Arts Understanding the structure of English language. Use appropriate forms of English.

Materials: Writing paper

Directions: Choose one:

1. Compose a fish tale from various points of view (the fish, the fisherman, the worm, the hook) and share it orally with other students.

2. Compose and read a fish story about "The Big One That Got Away."

Activity 16: How Far Can You Cast?

Proficiency/Indicators:

Mathematics Computation, estimation, measurement, and graphing.

Language Arts Think critically and reflectively.

Materials: Fishing pole for casting with a dummy weight on the end of the line, graph paper

Directions: Bring in a fishing pole and dummy fly (without hooks). Have each child estimate how far his or her cast will be. Each child may take one cast and measure the actual distance. Record the results on a graph. In small groups, problem solve ways this could improve their cast. Overhand verses side arm - wind factor - wrist action. Then, recast and test your hypothesis.

Activity 17: Indiana Fishing

Proficiency/Indicator:

Social Studies Identify, describe, and evaluate the influence of geographic factors.

Materials: Indiana Map, United States Map

Directions: Discuss and locate two of the following:

1. Different lakes, ponds, streams, and rivers that children have fished.
2. Trace the journey of the Wabash, White, and Tippecanoe rivers from their origin to the Gulf of Mexico.
3. Locate state fish hatcheries on an Indiana map.
4. List the Indiana counties that the Tippecanoe River (or another river) flows through.
5. List the county seats that sit on the Tippecanoe River and explain why they are located on the river.

Activity 18: Check your oil, Mallard?

Proficiency/Indicator:

Science Use basic investigation skills in examing new events and ideas. Invent and test if then "speculations."

Why don't ducks get wet when they swim?

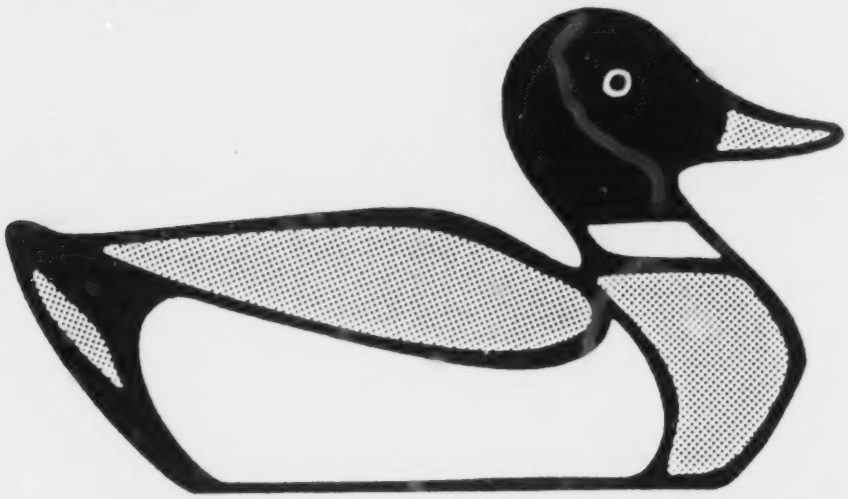
Ducks have a gland that is located on their tail. The gland is located where the tail joins the back. The gland makes and stores a special oil. A duck reaches back with its bill to get the oil and to spread it on its feathers. This is called preening. Since water will not mix with oil, the oil keeps water from soaking into a duck's feathers. A duck's special oil waterproofs it feathers. All birds preen. But water birds need more oil than other birds. Prepare a glass with oil and water to be placed on the science table for observation. What happens to the mixture?

Materials: Water, oil, and a beaker

Directions: Relate what you have learned about the article.

Extended Activity: As a creative writing activity, have students write about a duck that is low on oil.

Directions: Read the article about ducks. Prepare a glass with oil and water to be placed on the science table for observation. What happens to the mixture? Relate what you have learned back to the article.



Activity 19: I Feel Ducky

Proficiency/Indicators:

Literature Use a variety of techniques to express thoughts and feelings and to respond to others.

Mathematics Use number sentences to demonstrate relationships between whole numbers.

Materials: Read "A Ducky" story: See resource page at the end of topic section.

Examples: *Make Way for Ducklings, Ugly Duckling, Little White Duck*, etc.

Directions: Mind map or list all the things that make students feel "Ducky" (good). Have children act out being ten ducks. Have some of the ducks swim away. Write math problems to match the stories.

1 + 3 = 4

Water Experience for The Big Splash

CARTESIAN DIVER

The students will see pressure on an object demonstrated.

Needed: Soft drink bottle, one-half by four inch aluminum foil, and water

Advanced Preparation: Rinse bottle and have strips of foil cut before beginning.

Procedures:

A. Wad the first three inches of foil into a small ball or head (do not compact so tightly there is no air left in head).

B. Leave last inch of foil for the body of the diver.

C. Lace diver into bottle.

D. Fill bottle to top with water.

E. Press thumb over the top of the bottle.

F. Diver should sink to the bottom of the bottle. Release thumb, diver should return to surface.

Expected Results: Pressure from thumb will compress the air inside the head, and the diver will sink.

Practical Applications (Questions to ask):

A. Why did the diver sink to the bottom?

B. What would happen if you poked holes in the head of the diver?

C. How is this similar to a scuba diver's air tanks?

Music to Integrate Where Meaningful

Surfer Girl and other Beach Boy songs.

Rubber Duckie

Riding the Tide

By the Sea

Splish Splash

Resources for The Big Splash

Six Foolish Fisherman. Benjamin Elkins, 1957, Scholastic

The Magic Fish, Freyda Littedale, 1986, Scholastic

Jump Frog Jump, obert Kalan, 1981, Greenwillow Books

No Ducks in Our Bathtub, Martha Alexandra, 1973, Dial

Seven Diving Ducks, Margaret Friskey, 1965, Children's Press

Angus and the Ducks, Marjorie Flack, 1930, Doubleday

Loud Mouth George and the Fishing Trip, Nancy Carlson, 1983

Seven Froggies Went to School, Kate Duke, 1985, Weekly eader

Make Way for Ducklings, obert McCloskey, 1941, Viking

The Summer of the Swans, Betsy C. Byers, 1970, Viking

Trumpet of the Swan, E. B. White, 1970, Harper

Frog and Toad Are Friends, Arnold Lobel, 1976, Harper and ow

A Duckling Is Born, Hans-Heinrich Isenbart, 1981, Putnam

Burtdow-The Deep Water Man, obert McLoskey, 1963, Puffin Books

The Rain Puddle, Adelaide Holl, 1965, Lothrop, Lee, and Shepard

The Wind in the Willows: The Riverbank, illustrated by Val Bird, a Wanderer Book, 1989, Simon and Schuster, Inc.,

The Frog Prints, B. L. Harwich, 1976, aintree ed.

What Ernie and Bert Did on Their Summer Vacation, Patricia Thackvay, 1977, Sesame Street/Golden Press Books

3 Days on a River in a Red Canoe, Vera B. Williams, 1981, Greenwillow Books

The Fisherman and His Wife, Grimm Brothers

Jonah and the Great Fish, Warwick Hutton, Atheneum Publishers, Inc.

The Complete Book of Sports Facts, Roy Winnick, 1981, Norback and Company, Inc.

The Official World Encyclopedia of Sports and Games, 1979, Padding Press Ltd.

Going Swimming, Heather Amery, 1987, Osborne Publishing Company

Going Swimming, Celia Berridge, 1987, Random House

There's a Caterpiller in My Lemonade, Diana Gregory, 1980, Addison-Wesley Publishing

Sea Swan, Kathryn Lasky, 1988, Macmillian

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Sports Firsts, Patrick Clark, 1981, Facts on File, Inc.

Guinnes Sports Record Book, David A. Boehm, 1988, Sterling Publishing Company, Inc.

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Organizations

American Swimming Coaches Association
One Hall of Fame Drive
Ft. Lauderdale, FL 33316

National Association of Underwater Instructors
PO Box 14650
Montclair, CA 91763-1150

Canadian Amateur Diving Association
333 River Road
Ottawa, Ontario, Canada K1L8H9

Polar Bear Club-Winter Swimmers
Chamber of Commerce Building
Coney Island, NY 11224

Canadian Amateur Swimming Association
333 River Road
Ottawa, Ontario, Canada K1L8H9

Underwater Society of America
PO Box 628
Daly City, CA 94107

Iceberg Athletic Club
3046 West 22nd Street
Brooklyn, NY 11224

United States Diving, Inc.
901 West New York Street
Indianapolis, IN 46202

International Swimming Hall of Fame
One Hall of Fame Drive
Ft. Lauderdale, FL 33316

United States Swimming, Inc.
1750 East Boulder Street
Colorado Springs, CO 80909

National Association of Diving Schools
641 West Willow Street
Long Beach, CA 90806

Aquatic Hall of Fame and Museum of Canada, Inc.
436 Main Street
Winnipeg, Manitoba, Canada R3B 1B2

Individuals

Tracy Caulkins
213 Ocella Street
Nashville, TN 37209

Rowdy Gaines
3822 Faine Cove
Winter Haven, FL 33880

Michael Gross Paul Erlich Strasse
6 D-6000
Frankfurt 70 West Germany

Micki King
PO Box 155
Air Force Academy, CO 80840

Greg Louganis
PO Box 4068
Malibu, CA 92065

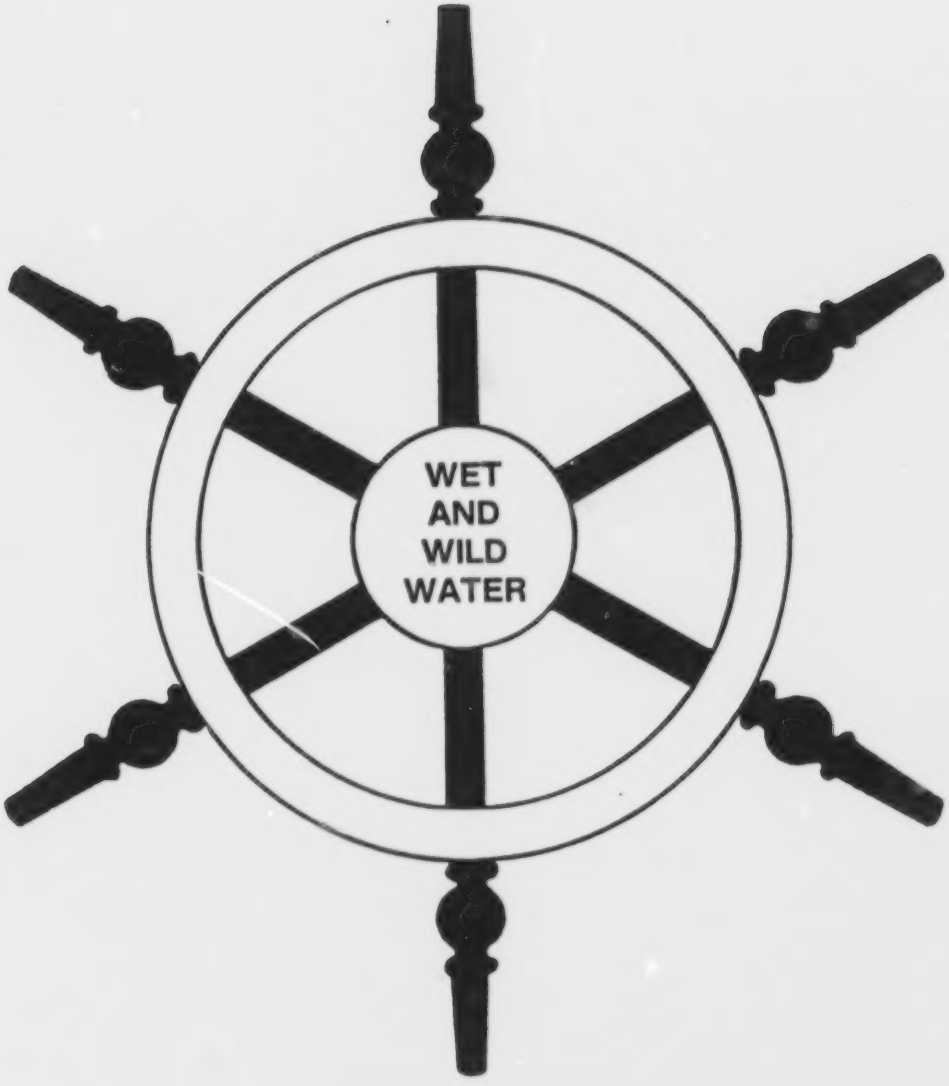
Patricia McCormick
PO Box 250
Seal Beach, CA 90740

John Nabor
PO Box 50107
Pasadena, CA 91105

Mary T. Meagher
First National Bank of Louisville
101 South Fifth
Louisville, KY 40202

Mark Spitz
383 Dalehurst
Los Angeles, CA 90024

Esther Williams
9377 Readcrest Drive
Beverly Hills, CA 90210



WHERE IN THE WORLD?
Famous Explorers of the Past

Magellan/Oceans

LaSalle/Mississippi River

Sea Shell, Sea Shell,
Sing me a song, O please!
A song of ships, and sailor men,
And parrots, and tropical trees,
Of islands lost in the Spanish Main
Which no man ever may find again,
Of fishes and corals under the waves,
Of sea-horses stabled in great green caves.
Sea Shell, Sea Shell,
Sing of the things you know so well

Amy Lowell
"Sea Shell"
The Complete Poetical Works of Amy Lowell by Amy Lowell
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Brinton P. Roberts, Esquire, and G. D'Andelot Belin, Esquire.

WHERE IN THE WORLD?
Famous Explorers of the Past

Introduction

Water plays a vital role in man's search for knowledge of the world around him. Explorers from across the continents have endured many hardships of the sea, including storms, starvation, exposure, shipwrecks, and even death . . . all in the name of discovery.

In this section, the explorations by Ferdinand Magellan and Robert de LaSalle are highlighted. Independent research of other famous explorers by intermediate students is encouraged, and geography study is recommended for all students. Resource information can be found at the end of the "Where in the World?" section.

CORE KNOWLEDGE
Explorer Information for the Teacher

North America

Country or Place	Event	Explorer or discoverer	Date
Greenland	Colonized	Eric the Red, Norwegian	c. 985
Labrador; Nova Scotia (?)	Discovered	Leif Ericson, Norse explorer	1000
West Indies	Discovered	Christopher Columbus, Italian	1492
North America Coast	Discovered	Giovanni Caboto (John Cabot), for British	1497
Pacific Ocean	Discovered	Vasco Nunez de Balboa, Spanish explorer	1513
Florida	Explored	Ponce de Leon, Spanish explorer	1513
Mexico	Conquered	Hernando Cortes, Spanish adventurer	1519-21
St. Lawrence River	Discovered	Jacques Cartier, French navigator	1534
Southwest United States	Explored	Francisco Coronado, Spanish explorer	1540-42
Colorado River	Discovered	Hernando de Alarcon, Spanish explorer	1540
Mississippi River	Discovered	Hernando de Soto, Spanish explorer	1541
Frobisher Bay	Discovered	Martin Frobisher, English seaman	1576
Maine Coast	Explored	Samuel de Champlain, French explorer	1604
Jamestown, Virginia	Settled	John Smith, English colonist	1607
Hudson River	Explored	Henry Hudson, English navigator	1609
Hudson Bay (Canada)	Discovered	Henry Hudson, English Navigator	1610
Baffin Bay	Discovered	William Baffin, English navigator	1616
Lake Michigan	Navigated	Jean Nicolet, French explorer	1634
Arkansas River	Discovered	Jacques Marquette and Louis Jolliet, French explorers	1673
Mississippi River	Explored	Sieur de La Salle, French explorer	1682
Bering Strait	Discovered	Vitus Bering, Danish explorer	1728
Alaska	Discovered	Vitus Bering, Danish explorer	1741
Mackenzie River (Canada)	Discovered	Sir Alexander Mackenzie, Scottish-Canadian explorer	1789
Northwest United States	Explored	Meriwether Lewis and William Clark	1804-06
Northeast Passage (Artic Ocean)	Navigated	Nils Nordenskjold, Swedish explorer	1879
Greenland	Explored	Robert Peary, American explorer	1892
Northwest Passage	Navigated	Roald Amundsen, Norwegian explorer	1906

* Explore: to search for new things or places.

* Discover: to be the first to find, see, or know about.

* Age of Exploration: the time in history of the great explorers, typically from 1000 A.D. with the Vikings to Robert de LaSalle's exploration of the Mississippi River in 1682.

* Explorers were usually in search of: unknown lands, food, spices, cloth, gold, and other treasures

In the Spotlight

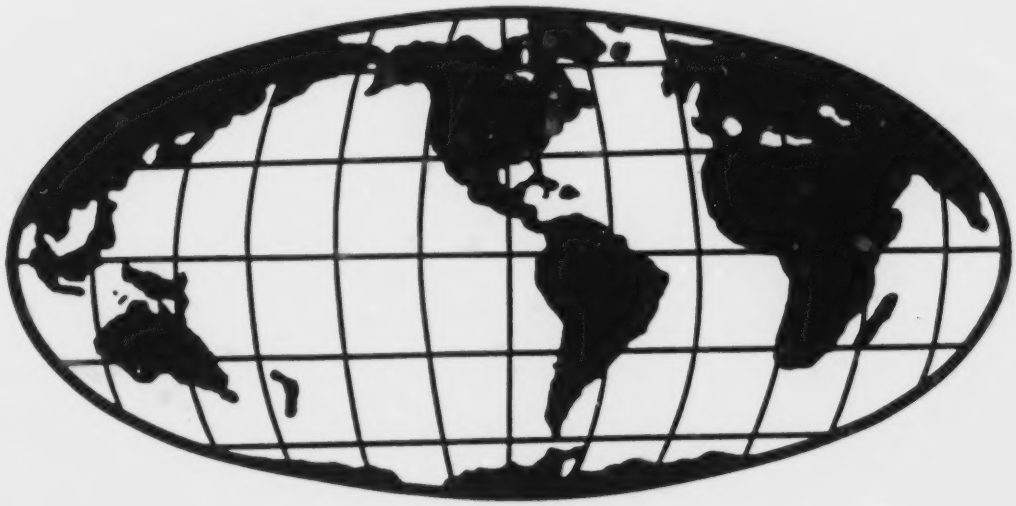
Ferdinand Magellan
The first man to sail around the world

- Born about 1480 in Portugal
- Died April 27, 1521, in the Philippines
- Parents died when he was ten years old.
- Became a page in Queen Leonor's court at age twelve.
- Learned fundamentals of navigation.
- Studied Christopher Columbus and Vasco De Gama in school.
- Knowledge of Columbus' success in the New World (1492) made Magellan wonder if the world was larger than most people supposed.
- Knowledge of De Gama's voyage (1499) around the southern tip of Africa and travels across an unknown ocean increased Magellan's curiosity.
- As a clerk in the marine department, he helped outfit ships for trade along the coast of Africa.
- Joined De Gama's crew in 1504 at age twenty-four and sailed to India.
- Believed he would reach Spice Islands by sailing south of South America instead of the eastward voyage around the southern tip of Africa and across the Indian Ocean.
- Set sail on September 20, 1519, for the Spice Islands with 241 men and a fleet of five ships: The Concepcion, San Antonio, Santiago, Trinidad, and Victoria.
- Discovered the Strait of Magellan through tip of South America on October 21, 1520.
- Reached the Philippines on March 16, 1521, and was killed in battle.
- The Victoria, with a crew of 18 men, sailed across the Indian Ocean and rounded the Cape of Good Hope, thus, completing the first voyage around the world.

WHERE IN THE WORLD?
Ocean Facts

Oceans and Seas

	Area		Average Depth		Greatest known Depth		
Name	sq.mi	sq. km.	feet	meter	feet	meters	deepest location known
Pacific Ocean	64,000,000	165,760,000	13,215	4,028	37,782	11,516	Mindanao Deep
Atlantic Ocean	31,815,000	82,400,000	12,880	3,926	30,246	9,129	Puerto Rico Trough
Indian Ocean	25,300,000	65,526,700	13,002	3,963	24,460	7,455	Sunda Trench
Arctic Ocean	5,440,200	14,090,000	3,953	1,205	18,456	5,625	77 45' N; 175 W
Mediterranean Sea	1,145,000	2,965,800	4,688	1,429	15,197	4,632	Off Cape Matapan, Greece
Caribbean Sea	1,049,500	2,718,200	8,685	2,647	22,788	6,946	Off Cayman Islands
South China Sea	895,400	2,319,000	5,419	1,652	16,456	5,016	West of Luzon
Bering Sea	884,900	2,291,900	5,075	1,547	15,659	4,773	Off Buldir Island
Gulf of Mexico	615,000	1,592,800	4,874	1,486	12,425	3,787	Sigsbee Deep



Activities to be used with The Study of Ferdinand Magellan and Ocean Facts

Activity 1: Whirlpools

Proficiency/Indicator:

Language Arts Listen for pleasure. Recognize some of the conventional structures in literary works, e.g., rhyme scheme. Write imaginative poems.

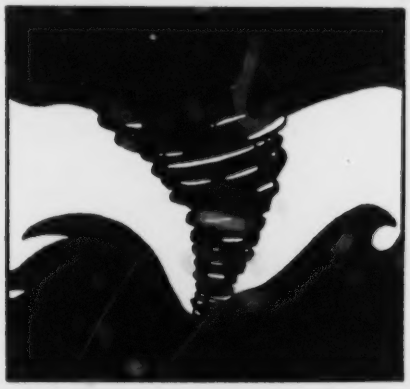
Materials: *The Hole in the Ocean,*
words and pictures by Jasper Tomkins,
The Green Tiger Press,
San Diego, California

This paperback is a Parents' Choice Award winner. Tomkins poetry and pictures are colorful and enjoyable for ages 8-13. The *New Orleans Times-Picayune* says the book explores whirlpools for all of us "who travel the surface of the sea and take tub baths as well."

Directions: Teacher reads the book and shares the illustrations.

Students use the poem as a model for writing their own verses. Discuss rhyme scheme. Use attached sheet - children complete rhyme.

List causes of whirlpools on poster board.



Create Your Own Verse

The Hole in the Ocean

It's grabbing us up with _____

And taking us down to _____

We've just passed a _____

There goes an _____

Down go the ships and down go the _____

Down go the birds and down go the _____

Look at the bugs and the _____

More and more cars and _____

Here is an octopus grabbing up _____

Now, look here, we tell him, you can't _____

Good-bye flowers and _____

Bicycles, barbells, _____

But there are whales to see and _____

Look out for that couch! Now _____

Activity 2: Where is the Water?

Proficiency/Indicator:

Social Studies Show how the geographical location of the community relates to the state and the nation.

Materials: World outline map

Directions: Make copies of the world outline map for students. Have them color in the water areas and label the oceans. Ask the students if there is more land or more water on our planet. Ask older students to estimate what portion of the earth's surface is covered by water (about 75 percent).

Extended Activity: Use a paper world map purchased at a bookstore. Have students cut out small boats of blue or red. Glue the red boats on the locations of important/large seaports of the world and the blue at famous ship building ports. Include: New Orleans, New York, San Francisco, etc.

* Students may need to research (use encyclopedias), looking up various countries for ascertaining the most important seaports/ship-building parts of that country. Landlocked countries need not be researched.

Activity 3: We Are the World

Proficiency/Indicator:

Social Studies Identify the physical and cultural characteristics of the United States and describe their relationships to geographic regions of the world.

Materials: World map, encyclopedias, atlas, resource books on countries

Directions: Refer to the Magellan Around the World map. Identify some of the countries he passed during his voyage. Compare and contrast cultures from different countries around the world. Include dress, habitats, food, language, customs, music, etc.

Activity 4: Shipbuilding

Proficiency/Indicator:

Mathematics Demonstrate an understanding of ratios, proportions, and percents.

Materials: Pictures of different kinds of ships, supplies for building, including popsicle sticks, toothpicks, glue, etc.

Directions: Conduct mini-research on a particular kind of ship (Viking, steamboat, galleon, etc.) Then construct a model of the ship, based upon the research.

* Older students are expected to build their models to scale.

Activity 5: Time Line Discovery

Proficiency/Indicator:

Mathematics Collect, organize, represent, interpret, draw conclusions, predict from data, using tables, charts, and groups.

Materials: Blank world map; exploration and discoveries chart located in core knowledge

Directions: Make a time line of famous explorers and their discoveries. Plot explorer names and the date of discovery on the map. Create story problems based on the time line.

For example:

What is the time span between Balboa's discovery of the Pacific Ocean and De Soto's discovery of the Mississippi?

Activity 6: Around the World

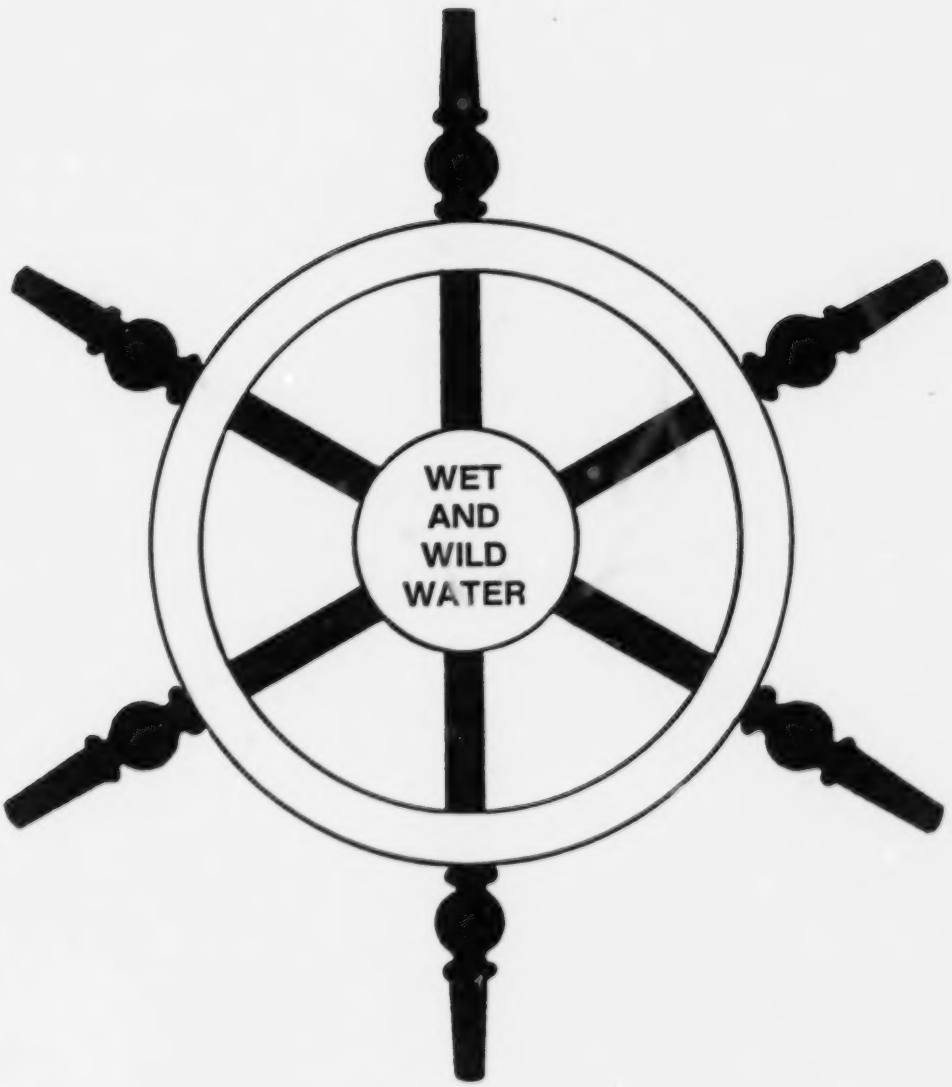
Proficiency/Indicators:

Social Studies Explain the relationship between physical and/or cultural features on the Earth's surface.

Mathematics Develop problem-solving strategies using computational math skills.

Materials: World map (included), string, calculator (optional)

Directions: Calculate the total number of miles travelled by Magellan's crew, beginning and ending in Lisbon, Portugal. You may want to divide the trip and your calculation, into smaller routes. Lisbon - Strait of Magellan, Strait of Magellan - Philippine Islands, etc.



WHERE IN THE WORLD?
Famous Explorers of the Past

Magellan/Oceans

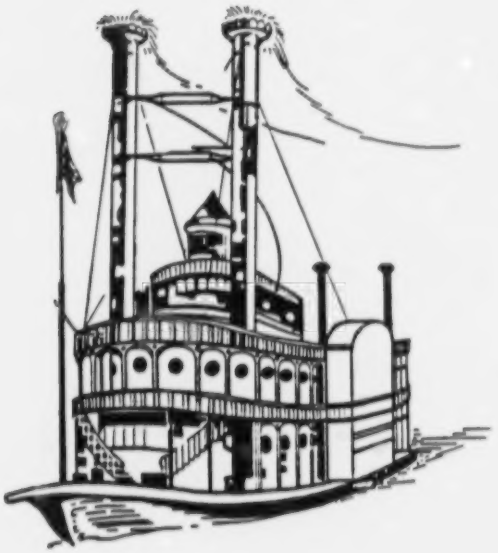
LaSalle/Mississippi River

Jump a raft and set your sail
The Great River will guide your way
Share adventure with Tom and Huck
The Mississippi will make your day.

In the Spotlight

Robert de LaSalle
The first white man to travel the entire length of the Mississippi River

- Born in France, 1643
- Died in 1687
- Studied to be a Jesuit priest.
- Came to New France in 1666 at age 23.
- Became a "master of trades": explorer, trader, politician, shipbuilder, diplomat.
- Wanted to build a chain of French forts stretching from the St. Lawrence River down the Mississippi River and to the Gulf of Mexico.
- Began his journey of the Mississippi River on February 6, 1682.
- Sighted the coast of Louisiana on December 28, 1684.
- Killed by an angry party member and was shot in the head March 18, 1687.



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Mississippi River Facts

- The Mississippi River is the longest river system in the United States.
- It is 3,986 miles long, but when figuring its 250 branches or tributaries, it measures more than 15,000 miles of waterway.
- It is the second longest river in the world; the Nile River, located in Egypt, measures 4,150 miles. South America's Amazon River is 3,900 miles in length.
- It is the third largest drainage basin in the world. A drainage basin is the land area that drains into a river.
- The Mississippi drainage basin covers an area over 1,243,000 square miles, about one-third of the United States.
- It receives water from 31 states and two Canadian provinces.
- It borders Wisconsin, Illinois, Kentucky, Tennessee, Mississippi, Minnesota, Iowa, Missouri, Arkansas, and Louisiana.
- The Ojibway Indians of Wisconsin called this great river "Missi Sipi" which means "Great River." It is also known as the "Father of Waters."
- The main river is formed by the joining of three principal tributaries: the Missouri, the Upper Mississippi, and the Ohio.
- An average of 350,000,000,000 (350 billion) gallons of water return to the sea each day.
- The depth of the Mississippi varies from the point of measurement. For example, it is quite shallow (less than a foot) in St. Cloud, Minnesota; between St. Paul,Minnesota, and Cairo, Illinois, it maintains a 9-foot depth; while in other places of the Lower River, it lies 40-100 feet deep, with some deeper parts gouging out 200 feet deep!
- The first white man to see the Mississippi River was a Spanish explorer named Hernando de Soto, on May 8, 1541.
- Upon De Soto's death (due to malaria), his men, fearful of attack, told the Indians that he was a god and his body had gone to the sky. Actually, they buried him in the Mississippi River!
- Famous author Samuel Clemens, who was born on November 30, 1835, and died on April 21, 1910, wrote about his childhood on the Mississippi River in *The Adventures of Tom Sawyer* (1876) and *The Adventures of Huckleberry Finn* (1884), *Life on the Mississippi* (1883).
- Clemens pen name, "Mark Twain," is a riverboat piloting term. Mark Twain means "Two fathoms deep" (12 feet or 3.6 meters). It also means "safe water ahead."
- Millions of people benefit from the Mississippi's water to drink, to irrigate farm lands, to provide energy, for transportation, and for recreation.
- Mississippi River Rat: "a person who recognizes the Mississippi River is unique in his or her personal world and that of all whom it touches, in whatever way and for whatever reason."

Activities to be used with The Study of Robert de LaSalle and Mississippi River Facts

Activity 7: Old Man River

Proficiency/Indicators:

Social Studies Explain the relationship between physical and/or cultural features on the Earth's surface.

Mathematics Develop problem-solving strategies using computational math skills.

Materials: Map of the United States (highlighting the Mississippi River), string

Directions: Calculate the total of miles traveled by Robert de LaSalle beginning in Itasca State Park, Minnesota, all the way to the Gulf of Mexico. Label important cities and ports along the river.

Activity 8: Fun in the Mud

Language Arts

Proficiency/Indicators: Use leisure time for listening to a variety of literature. Write to record information. Write in narrative sequence simple stories using sentences.

Mathematics Locate information on maps. Read and make use of print media.

Materials: *Mud Puddle*, Robert N. Munsch

This predictable story in paperback is usable with Grades K-3. It is a story of Jule Ann, who no matter how hard she tries, is attacked by "Mud Puddles." It has a commonality of experience for all children who frequently find ways to get into mud and water.

Directions: Teachers reads the story orally to students.

Students respond to repeated lines.

She washed out her ears.

She washed out her eyes.

She washed out her mouth.

She washed out her nose.

Mud making contest - the class is divided into cooperative groups (two to three students per group). Each group has a container (pan, tray) and the following ingredients and utensils:

water
straw
stirring utensils
dirt
measuring cups
sand
measuring spoons

The students are asked to record the amount of each item put in their pan. They may add as much of any ingredient they choose. The object is to produce the smoothest, finest consistency of mud possible. When finished, each group will share its recipe and product. Discuss cause/effect what ingredients seemed to effect the product in what ways.

Each group then takes its mud and packs it into a form (shoe box) and dries it outside for several days. The bricks are the field test:

a. Which brick dried the best (did not crumble)?

b. Which brick kept its form best (shape)?

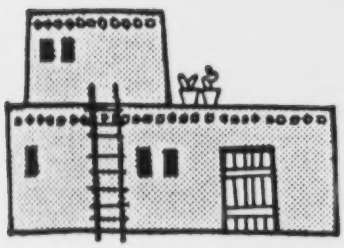
c. Which brick withstands hitting/throwing, etc.

Class selects the best recipe.

Other Muddy Activities Write a story about a time when you got all muddy.

Use mud to draw a "mud man" or to sculpture a "mud man."

Locate on a world map, countries that use mud to build houses.



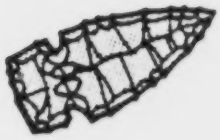
* Ask a person from another country to talk to class about how mud is used in buildings, i.e.:

Africa
American Indians (West)
India
Pakistan
Afghanistan*
America

* Dr. Juma Bandawal - Department of Education
(317) 232-9141.

Call a lumberyard and ask for printed materials/costs on bricks for students to read. Estimate the number of bricks necessary for building a house and the cost of the bricks.

Activity 9: Father of Waters



Proficiency/Indicators:

Social Studies Identify the physical and cultural characteristics of the United States and describe their relationships to geographic regions of the world.

Materials: United States political map, resource materials on Native Americans

Directions: The Mississippi River was of great importance to the Native Americans. Focus this map activity on the relationship between Native Americans and the Mississippi River.

Locate:

a. Names of Rivers
(Arkansas, Ohio, Missouri)

b. Names of Cities
(Sioux City, Kansas City)

c. Names of States
(North Dakota, South Dakota, Nebraska, Wisconsin)

Extended Activity: Learn and use Indian sign language.

Activity 10: Dear Diary

Proficiency/Indicator:

Language Arts Write for different purposes and audiences using a variety of forms.

Materials: Information on Magellan's and LaSalle's journeys

Paper and pencil

Directions: Write a journal based upon either Magellan's or LaSalle's expeditions. Include details about your feelings toward the hardships you faced during your trip.

Activity 11: Pirates on the High Seas

Proficiency/Indicator: Listen and respond for a variety of purposes.

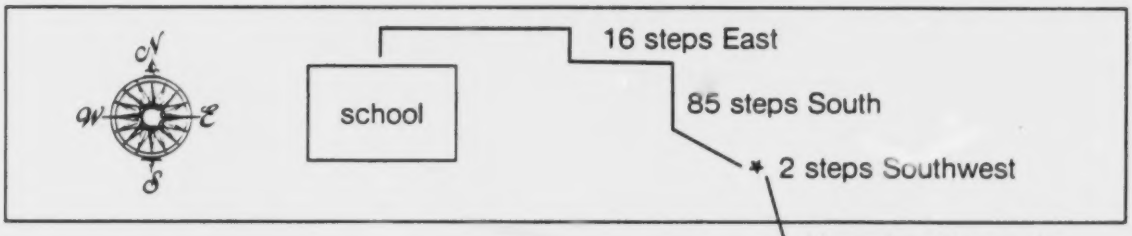
Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: *Peter Pan*, J. M. Barrie; VCR tape of *Peter Pan*

Peter Pan is a classic that all children should encounter between the ages of five and twelve

Directions: Teacher reads orally a chapter a day.

Divide class into groups. Use Captain Cook's map to locate buried treasure. Teacher will want to modify this map for a specific school yard. Students use map and complete.



_____

_____

_____

* Teacher may want to give each group a different map and may want to bury some treasure (candy wrapped in gold foil).

Extended Activities: Students in groups draw a treasure map and bury treasure. Exchange maps and hunt treasure.

Students illustrate and collate a "Pirate Alphabet Book."

Example:

a - anchor

b - boat/bow

c - cache

d - dinghy/dubloom/deck

e - eel

f - fish

g - gold/gunnels

h - helm/hook

i - island

j - jib/jolly roger

k - keel

l - leeword/lifeboard

m - mast

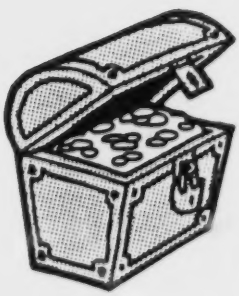
n - crow's nest

o - ocean/overboard

p - plank/pirate/plumes

q - quest

r - ruffian



s - sails/stern/sea/sword skull and crossbones

t - top sail/treasure

u - undertow

v - velvet

w - whales

x - marks the spot

y - yawl

z - a sleeping pirate zodiac (rubber boat with power motor)

Activity 12: Packing Your Bag

Proficiency/Indicator:

Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: *The Adventures of Tom Sawyer*

Directions: Read or have students read the chapter about Tom's island adventure from *The Adventures of Tom Sawyer*. Ask students to make up a list of supplies they would bring with them if they were going to stow away on an island. Share individual lists in small groups; then compile a group list where everyone must reach a consensus on the most important items.

Activity 13: African Tales

Proficiency/Indicator:

Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: African folktales, including *Why Mosquitoes Buzz in Peoples' Ears*, and *Mufaro's Beautiful Daughters*

Directions: Read African folktales in class.

Have students participate in any of the following activities:

a. Dramatize the folktale.

b. Rewrite and update the tale.

c. Compare an African tale with a tale from Brothers Grimm or H.C. Anderson.

d. Design jewelry from wood or clay.

Suggested Music for Where in the World?

It's a treat to beat your feet on the Mississippi Mud

Ships That Pass in the Night

Sailing
Christopher Cross

Old Man River

Swanee River

Moon River

"Blues" or Jazz music

St. Louis Blues

Maple Leaf Rag

Ragtime music
Scott Joplin

Red River Valley

Water Experiences for Where in the World?

These will relate to the study of ships and explorers.

Water has a special lifting force called buoyancy that helps things float.

Provide a container of water and a box of materials (paper clips, marbles, cork, sticks, beads, rocks, sponges) for experimenting with sinking and floating. The children will discover that heavier items sink, and lighter items float. However, through experimentation, they can also discover that items that sink are not always heavier than those items that float. Begin with two equal balls of oil-base clay. Ask the children if they think the clay balls will sink or float; then let them see that the clay will sink. Shape one of the balls of clay into a boat so that it will float. As an alternative, provide each child with a container of water, or have the children gathered around a trough of water. Give each of the children a ball of the oil-base clay and ask whether they can do something to it so that it will float and not sink. If oil-base clay is not available, aluminum foil can be used, Ships do not sink for the same reason that this small clay boat does not sink. The boat is larger than the ball and pushes aside, or displaces, more water than the ball. The amount of water pushed aside, or displaced, by the boat weighs more than the boat itself. The water pushes the boat up until the weight of the boat and its cargo equal the weight of the displaced water.

Put an empty, capped detergent bottle in a bowl or tub of water. It should float. Put a small amount of water in it, and it should still float. As more water is added, it sinks lower and lower, because an object will float if it is lighter in weight than the amount of water that would take up an equal amount of space. This same experience can be performed with smaller plastic bottles.

For younger children, a simpler explanation might be that some objects are too heavy to float, or some objects are not porous enough (do not have enough air in them), or some objects need to be shaped like a boat in order to float.

Look at the list of objects and predict if they will sink or float in water. Then, try to float them in a container of water and see if your predictions were right.

Objects: bottle cap, cork, button, paper clip, piece of paper, toothpick, plastic straw, styrofoam, plastic cup, rubber band, and a ball of oil-base modeling clay.

Application

Create a floating raft or boat using materials you find at home or in the classroom. Try your floating device and see if it works. Make changes if you need to.

Think of a way you can make objects float that cannot float by themselves. Brainstorm ways to do this with a partner and, then, think of a way to try one of them in class to see if you are right.

Problem Solving

How many people weighing 100 pounds each could get into a wooden rowboat 4 feet by 6 feet before it would sink?

Water Experiment

Float a wooden block in a glass/pan of water. Place metal bolts or nuts on the piece of wood until it sinks. Try this with different amounts of water in the glass/pan. Does the amount of water in the glass/pan make a difference?

* This is the foundation for a more advanced lesson in density.

Using a glass, water, and a wooden block have students:

1" water - add block	2" water - add block	3" water - add block
Does it float?	Does it float?	Does it float?

1. How much water must be in the glass before the block will float?
2. Can humans float in an inch of water?
3. How much water must we be in before we can float?
4. What conclusions can we draw?

Archimedes' Principle

Fill a container up to the brim with water and weigh it. Then place a block of wood on the water, and some of the liquid will spill out. Weigh again, to find out if the weight has altered.

The weight remains the same. The water spilt out of the container weighs exactly the same as the whole block of wood. The famous mathematician Archimedes discovered in about 250 B.C. that a body immersed in a liquid loses as much weight as the weight of liquid displaced by it. This apparent loss of weight is called buoyancy.

Ship on a High Sea

Place a half dollar on the table, and on one side of the coin, a small cork disk. How can you move the cork to the exact center of the coin without touching it? Pour water onto the coin - dropwise, so that it does not spill over - to form a water mountain over the surface. At first the force of gravity holds the cork on the edge of the slightly curved water surface. If you now pour on more water, the pressure of the water on the edge increases, while it remains constant on the top. So the cork moves up the hill to the middle, which is the region of lowest pressure.

Dance of the Moth Balls

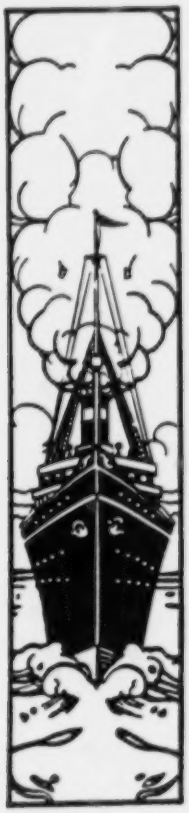
Add some vinegar and bicarbonate of soda to some water in a jar. Toss several moth balls, which you can color beforehand with a crayon, into the bubbling bath to make the experiment more fun. After a time, the balls dance merrily up and down. Since the moth balls are a little heavier than water, they sink to the bottom of the jar. The carbon dioxide freed by the chemical reaction between vinegar and bicarbonate of soda collects in bubbles on the balls and lifts them slowly to the surface of the water. There the bubbles escape, the balls sink again, and the performance is repeated.

Pearl Diver

Stick a match about one-tenth of an inch deep into a colored plastic bead and shorten it so that its end floats exactly on the surface of the water when the bead is placed in a milk bottle full of water. Close this with a plastic cap. By changing the pressure on the cap, the bead can be made to rise and fall as though bewitched. Plastic is only a little heavier than water. The match and the air in the hole of the bead give it just enough buoyancy for it to float. The pressure of the finger is conducted through the water and compresses the air in the bead. Thus, it no longer has sufficient buoyancy and sinks.

Cut a small boat out of fresh orange peel and make portholes on it with a ballpoint pen. Place the boat in a bottle filled with water and close it with a plastic cap. If you press on the cap, the boat rises and falls according to the strength of the pressure. Minute air bubbles in the porous fruit peel make it float. By the pressure of the finger, which is transmitted through the water, the bubbles are slightly compressed, so their buoyancy is less, and the boat goes to diving stations. Since the yellow of the peel is heavier than the white, the submarine floats horizontally.

You can accompany the submarine by several 'frogmen.' Simply toss broken-off match heads with it into the bottle. They float because air is also contained in their porous structure. If the air bubbles are made smaller by the transmitted water pressure, the match heads dive deeper too.



Experiments for Where in the World?

SHIPS AHOY!

To observe the relationship between shape, density, and buoyancy.

Materials: Modeling clay, washers, bowls of water, towel paper to clean up water spills

Procedures:

A. Give each student some clay (about 1/2 pound) to design a boat that will hold the greatest amount of washers when placed in a bowl of water (make sure each student has the same amount of clay).

B. Have students keep a count of how many washers their boat will hold before sinking.

Practical Applications:

A. Why does the shape of the boat make a difference in the amount of weight it will hold?

B. Why are ships shaped differently?

C. What was the best boat design to use for this type of experiment?

MAKING OCEAN WATER

The students will be shown that an object will float higher in "ocean water" than fresh water.

Materials: Tablespoon, one quart jar, water, epsom salts, rock salt, straw (big, plastic kind), sand, clay, marker or felt tip pen

Procedures: Demonstrate the following:

A. Have a quart jar filled 3/4 full with tap water.

B. Plug the end of the straw with modeling clay to make it air-tight and sealed.

C. Place straw upright in the jar.

D. Put enough sand into the straw to cause it to float straight up and down (amount of sand should be over halfway as pictured in diagram).

E. Add or remove enough sand so that half of the straw is above the water.

F. Take a pen and put a mark on the straw at the water level, then remove it carefully, not spilling any sand.

G. Put two tablespoons of rock salt and one tablespoon of epsom salts in the jar of water.

H. Put weighted straw back in.

I. Add more salt and see if straw becomes more buoyant.

Expected Results: The straw will float higher in the salt water than in the tap water. The saltier the water, the more buoyant the straw.

Practical Applications: A. Does salt water affect ships?

B. Can the buoyancy of objects in water be controlled? If so, how?

Additional Information: Warmed candle wax be substituted for clay, but must be heated indirectly over a hot plate.

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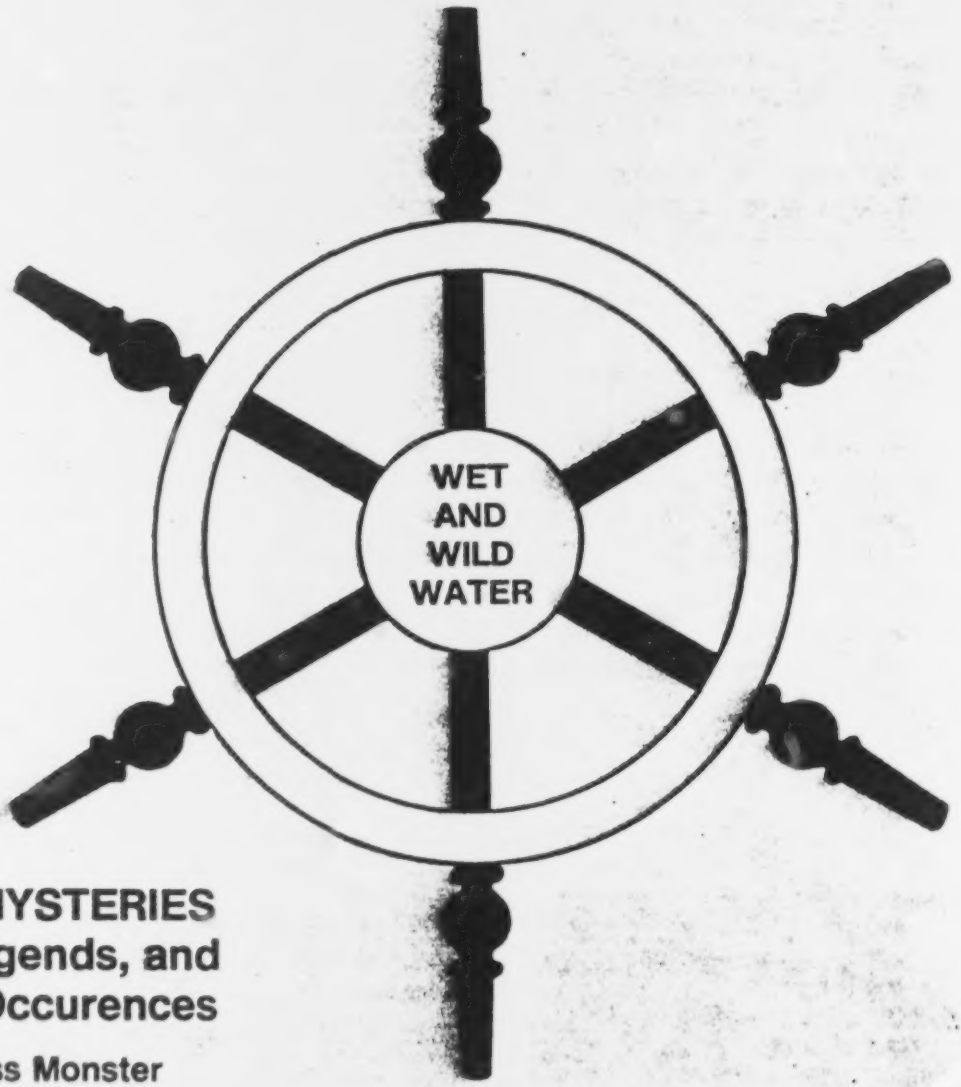

WATER MYSTERIES
Myths, Legends, and Strange Occurences

Loch Ness Monster

Atlantis

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The Slithergadee

The Slithergadee has crawled out of the sea
He may catch all the others, but he won't catch me.
No, you won't catch me, old Slithergadee,
You may catch all the others, but you wo ____

Shel Silverstein

WATER MYSTERIES
Myths, Legends, and Strange Occurrences

Introduction

The study of water opens our eyes and imagination to many mysteries about the unknown. Mysterious creatures of the deep have often influenced authors to create tales that excite readers of all ages.

In this section, the legends of the Loch Ness Monster and Atlantis are investigated. This knowledge can stimulate interest in other water mysteries and be expanded to reading and studying about pirates, treasures, and mysterious water creatures. Resource information can be found at the end of "The Water Mysteries" section.

CORE KNOWLEDGE
Loch Ness Information for the Teacher

Lake Loch Ness is in Northern Scotland. The water is full of peat particles, and it is inky black. Loch is a Gaelic word meaning lake. Loch Ness is famous because many believe a monster lives there. People have been seeing it for more than 1,400 years. Different names have been given the monster (Great Beastie, Loch Nabeiste, Water Horse, Water Kelpie, and Beastie).

(Lake) Loch Ness

24 miles long

2 miles wide at widest point average depth - 700 feet deep

There is a story about Saint Columba who asked a man to swim across Loch Ness to bring back a boat from the opposite bank. While the man was swimming, a huge monster came up out of the water. Saint Columba said to the monster, "Go no further, go back." The beast turned and disappeared. Since that story, more than 4,000 documented sightings have been reported.

What could Nessie be?

1. A type of reptile? Reptiles do not like freezing temperatures. It is believed the monster spends time on the bottom of the lake which is 0 degrees above freezing (-12 c). Scientists counter that it has adapted to low temperatures like the leather-back or green turtle.

2. Invertebrate? Animals without backbones are very flexible in their movements.

3. Giant Squid? Sea mollusks, with soft, boneless bodies, can move in all directions.

4. Giant Amphibian? Of the frog and neut family. The giant variety has been extinct for thousands of years.

5. Marine Reptile? A kind of sea-living dinosaur called Pleiosaur. This was a 20-foot-long, fish-eating dinosaur. This dinosaur is believed to have been extinct for several thousand years. It would not be the first time an animal thought to be extinct was discovered. The 5-foot fish, Coelacanth, was thought to be extinct for 70 million years.

There have been hundreds of reported sightings and strange occurrences related to the monster, including the following:

1. In 1933, a man and wife saw a 60-foot creature traveling at a high rate of speed.

2. In 1973, a farmer saw a creature that was black with humps like a camel, flippers like seals, a long neck, small horns, a slit mouth, and an eye above the mouth.

3. Water racer, John Cobb, was testing a jet propelled boat to set the water speed record. He went to Loch Ness because the water was very still. He was traveling 205 mph (330 km per hour) when some strange ripples occurred. The boat hit the waves and exploded, killing Cobb. Many believed Nessie caused the tragedy.

4. Scientists have attempted to solve the Loch Ness mystery by:

    a. Exploding dynamite in the lake, hoping to bring Nessie to the surface (nothing happened).

    b. Using sonar to track Nessie beneath the surface of the water. The results of this experiment showed that something was diving like a seal and swimming 10 mph.

Other Water Monsters

1. A monster called Afanc is believed to exist in Wales.
2. The Great Lake Monster is said to reside in Sweden.
3. A long-necked beast has been spotted in Siberia's Lake Khaiyn.
4. The Canadian Ogopogo has been sighted in Lake Okanagan.
5. In the United States, the Lake Champlain monster is called Champ. (In 1969, Samuel de Champlain, a French discoverer of the lake, wrote about a swimming monster - who was 20- feet long, thick as a barrel, and had a horse-shaped head.

Activities for
The Study of the Loch Ness Monster

Activity 1: How Did Nessie Get There?

Proficiency/Indicator: Explain the importance of the historical development of the community.

Social Studies Use of cardinal and intermediate directions and common map symbols.

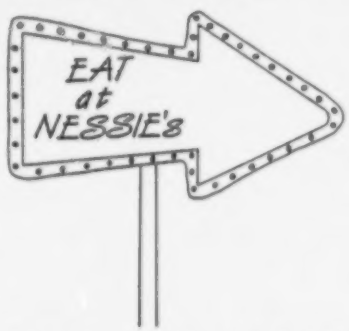
Materials: Information about the Loch Ness Monster and how the surrounding bodies of water to Loch Ness have changed through time;

Map of Scotland

Directions: Have the students study the map of Scotland. Brainstorm with a partner the question, How did Nessie get in the Loch Ness?

(Example: Could there be an underwater passageway? Was the lake at one time connected to the ocean?)

Additional Activity Question: If it is not real, what have so many people seen in Loch Ness?



Activity 2: Eat at Nessies!

Proficiency/Indicator:

Language Arts Write for different purposes and audiences, using a variety of forms.

Materials: Large drawing paper, writing paper

Directions: Individually or in a small group, design a fast food restaurant with a water monster theme. Design a menu and list the food and prices.

Extended Activity: Read the book, *Dragon Stew* by Tom McGowen, to the class.

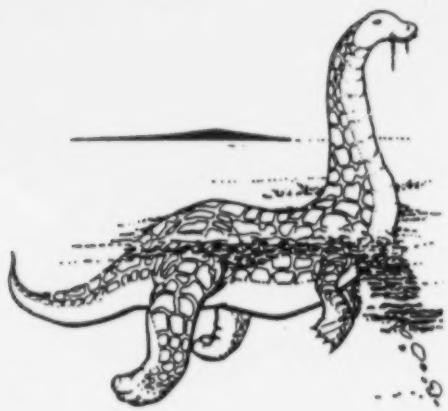
Activity 3: Nessie's Hard Rock Cafe

Proficiency/Indicator: Demonstrate basic skills in using a calculator.

Mathematics Use number sentences to demonstrate relationships among whole numbers.

Materials: Paper and calculator

Directions: Write five story problems, using the information on the menu in activity, "Eat at Nessie's." Work the problems and check them on the calculator.



Activity 4: Locating the Loch Ness Monster

Proficiency/Indicator:

Social Studies Show how geographical location of the community relates to the state and the nation.

Materials: Information about Loch Ness Monster. (See Core Knowledge and Resources section.)

Drawing Paper

A free list of Indiana lakes may be obtained from Indiana Department of Natural Resources, Map Sales Unit, 604 State Office Building, Indianapolis, IN 46204, (317) 232-4180.

Directions: Tell the class what a loch is and locate three lochs on an Indiana map. Draw a map showing Loch Ness in Scotland. Compare the size of Loch Ness with a nearby Indiana lake.

Activity 5: Nessie Interview

Proficiency/Indicators:

Language Arts Use a variety of techniques to express thoughts and feelings and to respond to others.

Social Studies Read and interpret graphs, charts, and cartoons.

Materials: Tape player

Directions: Work in pairs. Write a list of questions you would ask someone who has reported a sighting of Nessie. Ask your partner the questions and tape the answers.

Extended Activity: Children can pretend their partner is Nessie and conduct an interview.

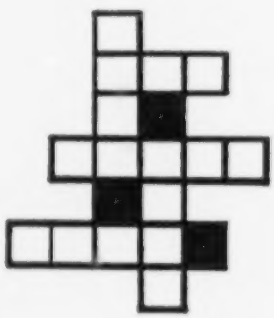
Activity 6: What's So Funny?

Proficiency/Indicator:

Language Arts Write for different purposes and audiences, using a variety of forms.

Materials: Long strips of drawing paper

Directions: Create a comic strip about Nessie.



Activity 7: Crossword Monster

Proficiency/Indicator:

Language Arts Write for different purposes and audiences, using a variety of forms.

Materials: Chart paper, vocabulary word list

Directions: Make a crossword puzzle about the Loch Ness Monster and other water monsters. Use vocabulary words from the information studied. Exchange papers and work each other's puzzle.

Activity 8: Mighty Monster

Proficiency/Indicator:

Social Studies Show how the geographical location of the community relates to the state and the nation.

Material: Drawing paper, map of Indiana

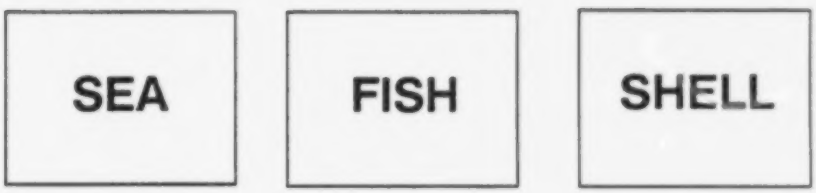
Directions: Create a monster for an Indiana lake. Name it and locate it on the map. Write a legend about your monster and share with the class.

Activity 9: Nessie Knows

Proficiency/Indicator:

Language Arts Write for different purposes and audiences, using a variety of forms.

Materials: Draw a picture of the Loch Ness Monster. Put water words on 3 x 5 cards.



Put these water words in A, B, C order.

Directions:

1. Have children write water vocabulary words on 3 x 5 cards.
2. Divide into two teams.
3. One player draws four cards.
4. The player puts the words in A, B, C order on Nessie.
5. The player on the other team does the same.
6. If the words are in the correct order, the team scores a point.

Activity 10: Mythical Monsters

Proficiency/Indicator:

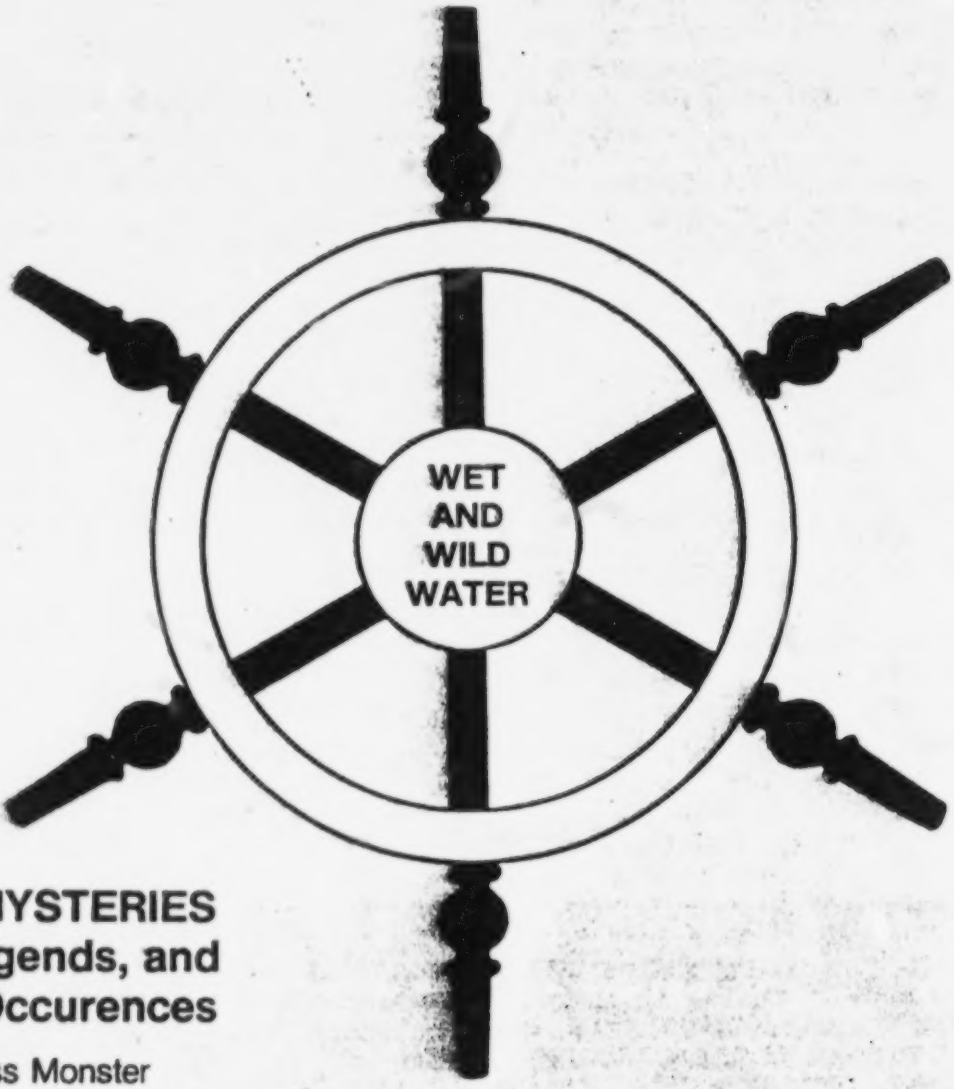
Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: The story, *The Little Mermaid* by Hans Christian Anderson, for Primary or excerpts from *Twenty Thousand Leagues Under the Sea* by Jules Verne, for older children.

(You could show the video, *The Little Mermaid*.)

Directions: This activity is based on the fact that some sea myths exaggerated descriptions of real animals, (i.e., mermaids may be based on manatees, or sea serpents may have their origins in the giant octopus). Divide the room into small groups and give each group a picture of a water animal or plant. Have each group make up a myth to share.

Extended Activity: Teacher can make up exaggerated descriptions about real plants and animals. Have the children guess or draw what they think the creature looks like. Show them pictures of the real plant or animal.



WATER MYSTERIES
Myths, Legends, and Strange Occurences

Loch Ness Monster

Atlantis

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Is there a land beneath the sea?
The legends tell us so.
The mystery of Atlantis
Is what we want to know.

CORE KNOWLEDGE
Atlantis Information for the Teacher

The story of Atlantis is a legend about a civilization located at the center of the earth. It was thought to be a land of golden cities with great ports and huge temples. Beautiful fountains bubbled with hot and cold water; mountains surrounded the royal city; and rivers, lakes, and meadows supplied enough food for every living creature. It was a peaceful nation and its citizens obeyed the laws of nature. This lovely land was called Atlantis. Did Atlantis ever exist, or was it simply the product of an ancient culture's imagination? Legends tend to get changed in the tellings, so we cannot be certain about the true facts of Atlantis.

Plato, a Greek philosopher who lived in the 4th century B.C., wrote about Atlantis in two dialogues, Timaeus and Critias. Dialogues are compositions in which two or more people carry on a conversation. Dialogues were a common form for telling tales of ancient history. Plato's story of Atlantis was a startling account of a continent that sank into the sea. It sank under the Atlantic and was lost forever. It was thought to be about 800,000 square miles. (That would be three times the size of Texas.)

There are many theories about a land under the ocean. Some are listed below:

1. Atlantis was an island near Greece. The island disappeared in a volcanic explosion.

2. The Greek island of Thera was Atlantis. The island was destroyed during a volcanic eruption during 1400 B.C. Archaeological digs produced evidence of an advanced ancient culture. Under the volcanic ashes, scientists found the remains of:

   - two or three buildings
   - balconies
   - frescoes on buildings showing men, birds, plants, antelope, and apes not found in that area

   They believe that approximately 30,000 people had lived there. There were not any remains, so scientists believed the people had been forewarned.

3. In ancient Gaul, Ireland, and Wales, the people believed their ancestors came from a continent that sank into the western sea. The Welsh and British called this place, "The lost paradise of Avalon." This appears in ancient tales of King Arthur and His Courts.

4. Alea is located in Southern France and Northern Spain. The people who live there speak a language unlike any other language in Europe. They believe their ancestors come from a country called Atlaintika.

5. Ancient Vikings believed in a marvelous land in the west called Atli.

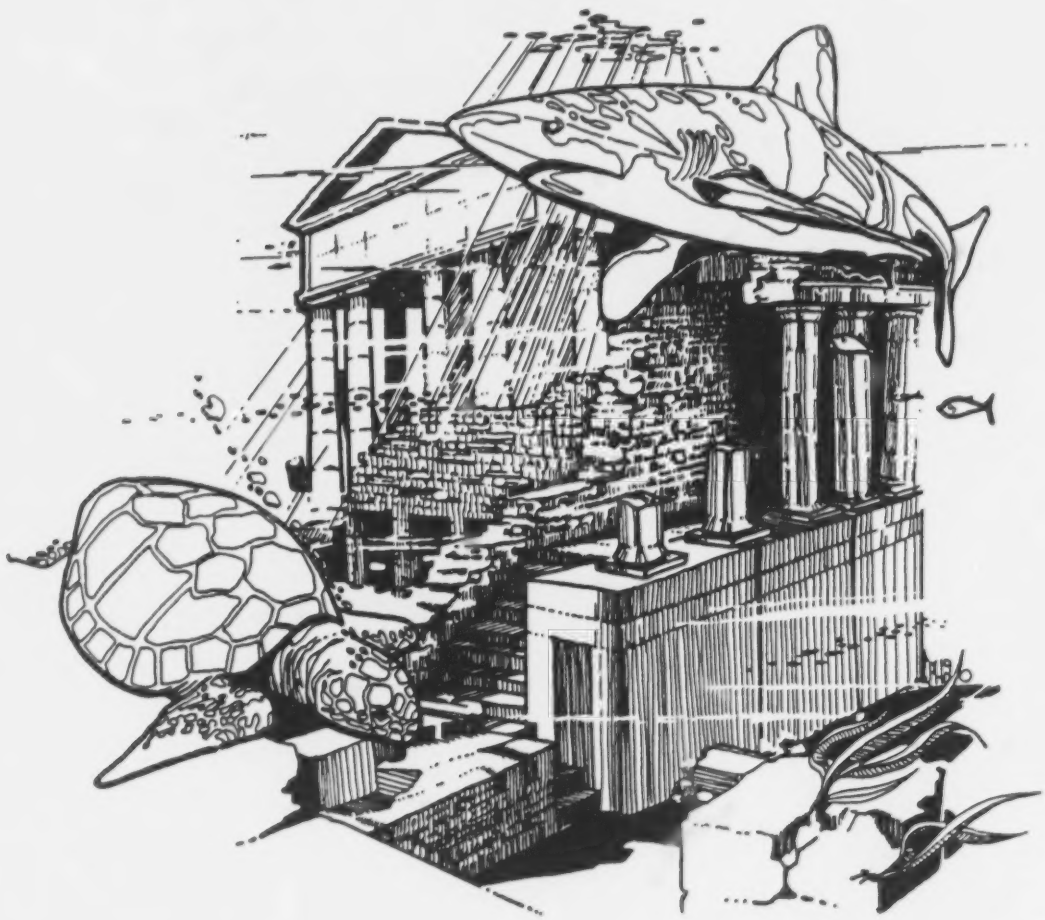
6. Sailors from Venice and Carthage knew of an island called Antilla. They kept it a secret, so it would not be colonized.

7. Egyptian hieroglyphics talked about Amenti, a paradise of the west.

These legends do not prove that the continent of Atlantis did exist, but they do prove that Plato did not simply invent the story of Atlantis.

Stories keep the legend of Atlantis alive. Legends tell of the sinking of great land masses, of the earth shaking, and of islands disappearing into the ocean.

There have been massive unexplained underwater ruins found in the Atlantic Ocean. Did these mysterious ruins come from an ancient Atlantian culture? Some evidence may be considered between Atlantis and the Bermuda Triangle. (This could be another underwater mystery to study.)



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Activities to be used with The Study of Atlantis

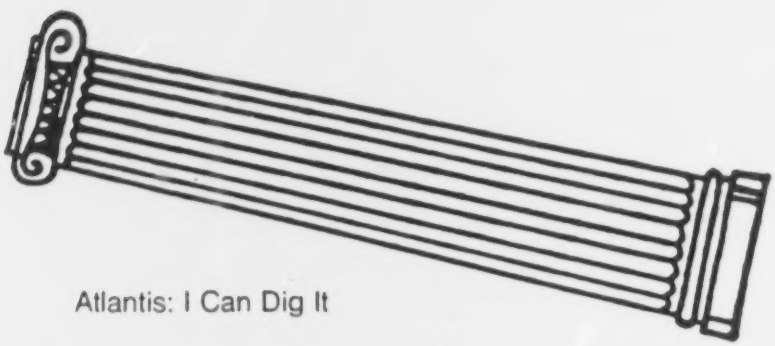
Activity 1: You Are There!

Proficiency/Indicator:

Language Arts Use a variety of techniques to express thoughts and feelings and to respond to others.

Materials: A background of knowledge of Atlantis (check Core Knowledge), an imagination, writing and drawing paper

Directions: Have the students write poems, stories, or legends about Atlantis, and draw an illustration of what they think Atlantis looked like.



Activity 2: Atlantis: I Can Dig It

Proficiency/Indicator:

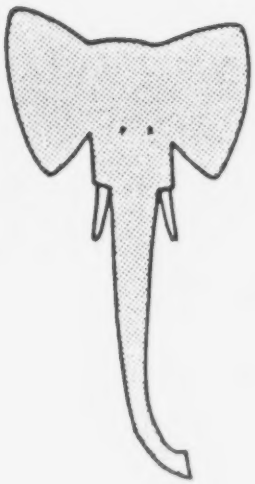
Language Arts Respond actively and imaginatively to the literature they encounter. Listen and respond for a variety of purposes.

Materials: *Atlantis The Missing Continent* by David McMullen, Raintree Children's Books, Milwaukee

Directions:

1. Teacher reads a chapter each day to the students or "snowball" reading by students (Student reads a chapter and tells his part to the class).

2. Clues: *A Journey Into the Unknown*. Children get into small groups and are given one bag of clues. If Atlantis did exist, (from the clues - pictures, riddles, etc.) determine its location and environment, based on Plato's description from the book.



Examples:

- Atlantis may have been located in the Atlantic Ocean, North America to the west, Europe to the east, South America to the south, Africa to the west.
- Silver, ivory, gold, copper buildings - picture or describe
- Animals (elephants) - picture or describe
- Grapes - picture or describe
- Coconuts - picture or describe
- Three water rings surrounded Atlantis
- Temple of Poseidon
- Sailors/slaves
- Mountains

From clues, the students may choose to: construct a replica of Atlantis (choices of art forms are: playdough or collage, write a rap or a song, write a play to be performed in class.

Activity 3: Wynken, Blynken, and Nod

Proficiency/Indicator:

Language Arts Listen and respond for a variety of purposes.

Materials: *Wynken, Blynken, and Nod* by Eugene Field

This is available in a large book or a paperback with wonderful illustrations by Ron Beiz. It is a classic poem children should experience between the ages of five and nine.

Directions: Teacher reads the poem orally to students. Have students close their eyes and visualize while listening to the poem - then, read again while sharing the illustrations. Discuss their visual pictures and how they were alike or different from the illustrator.

List how a trundel bed and a boat are alike or different.

What is Wynken and Blynken? - eyes
What is Nod? - head
What is the wooden shoe? - trundel bed
What are the fish? - stars

Discuss lullabies - name some familiar ones.

Sing, "Mama's Gonna Buy You a Mockingbird," "Rock a Bye Baby," etc.

Use black paper and colored chalk to illustrate the story.

Activity 4: Sea Shell Detective

Proficiency/Indicator:

Science Sort, group, or arrange objects, systems, ideas, or events on the basis of similarities, differences, or a suggested standard.

Materials: A collection of four or five labeled sea shells in a sand pail, magnifying glass

Directions: Answer these questions while you examine this shell collection:

Which shell is the largest?
Which one is the prettiest?
Which one has the most color?
Which had the smallest animal?
What object does each shell look like?

Activity 5: Future Underwater City

Proficiency/Indicator:

Social Studies

Explain how people make choices about using goods, services, and resources to satisfy their economic wants.

Explain the importance of historical development of the community.

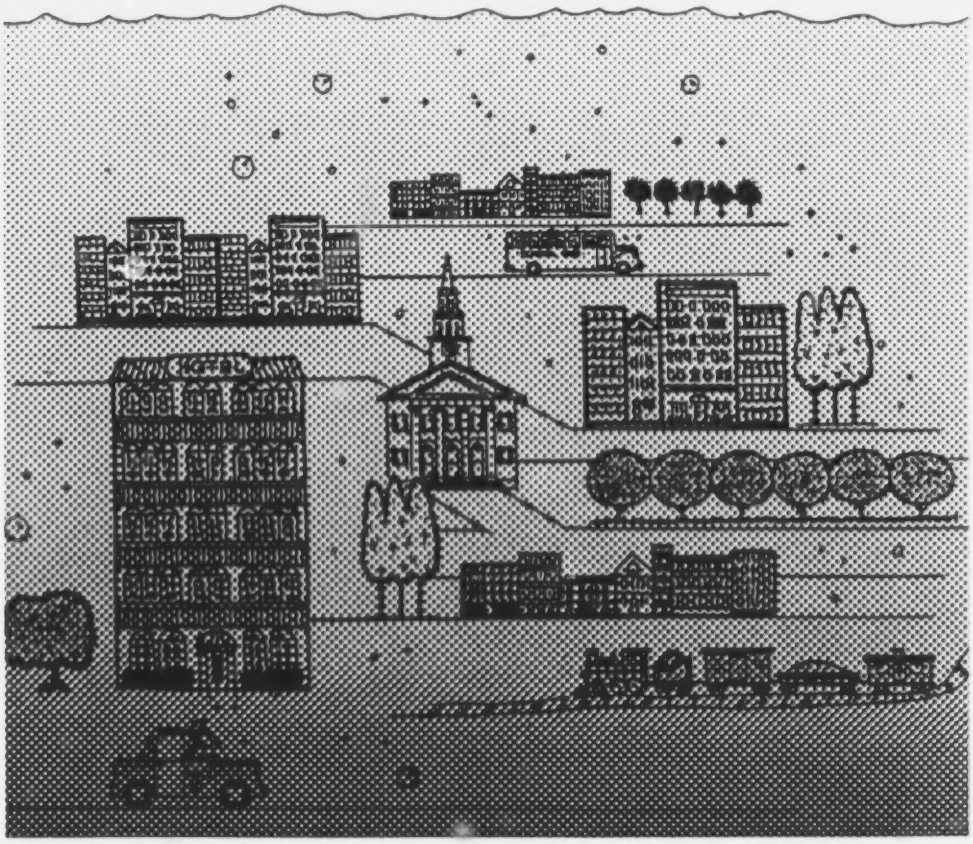
Identify the major services provided by local governments.

Materials: Children bring items from home to build cities (scraps, bottle caps, plastic, boxes, anything)

Directions: Divide the room into groups of four or five. Have them plan an underwater city. Draw a map of it on poster board and build it on their desks.

This could also be one large city on a big table in the room, or it could be a mural the whole class creates together.

Include: air supply, schools, food, water removal, transportation, energy supply, and occupations, government buildings.



Water Experiences for Water Mysteries

Information

There are three forms of water: solid, liquid, and gas. Each form has special properties. Let's begin with the properties of liquid water: water molecules are attracted to each other. On the surface of the water, this attraction forms a skin, and this is called surface tension. When water becomes soapy, the surface tension forces become weaker.

Floating Metal

Fill a bowl with tap water. Place small metal objects on blotting paper and carry it carefully in the dish with a fork. After a time, the saturated blotting paper sinks, but the small objects remain floating.

Since metal is heavier than water, it should really fall to the bottom. The liquid particles are held together so strongly by a mysterious force, the surface tension, they prevent the objects sinking. Surface tension is destroyed by soap.

Rope Trick

Knot a piece of string into a loop and allow it to float in a bowl of water. If you dip a match into the middle of the irregularly shaped loop, it immediately becomes circular.

The match has this magic power because it was previously dabbed with a little washing-up liquid. This spreads in all directions when the match is dipped into the water and penetrates between the water particles which were held together like a skin by surface tension. This 'water skin' breaks outward in a flash from the place where the match is dipped. The liquid particles which are made to move and push against the loop making it rigid.

Speedboat

Split a match slightly at its lower end and smear some soft soap into the slit. If you place a match in a dish of tap water, it moves forward quickly for quite a time. Several matches could have a race in a bath tub.

The soap destroys the surface tension of the water by degrees as it gradually dissolves. This causes a backward movement of the water particles which produces, as a reaction, a forward movement of the match. With a drop of detergent instead of the soap, the movement would be like a rocket.

Watertight Sieve

Fill a milk bottle with water and fasten a piece of wire gauze about two inches square over it. Secure with a rubber band. Place your hand over the top and turn the bottle upside down. If you take your hand away quickly, no water comes out.

Where water comes into contact with air, it surrounds itself as though with a skin, because of its surface tension. Each opening in the wire gauze is so well sealed that air can neither flow in, nor water flow out. This also occurs with the fine holes of tenting materials which is made water- repellent by impregnation. Raindrops cannot get through because of their surface tension.

Liquid String of Pearls

Let a fine jet of water pour on a finger held about two inches under the tap. If you look carefully, you will see a strange wave-like pattern in the water. If you bring your finger closer to the tap, the waves become continuously more ball-shaped until the water jet resembles a string of pearls.

The water is so strongly obstructed by the finger that because of its surface tension, the force which holds the water particles together, it separates into round droplets. If you take your finger further away from the tap, the falling speed of the water becomes greater, and the drop formation is less clear.

Pierce an empty two-pound can five times just above the lower edge with a thin nail. The first hole should be just over an inch from the fifth. Place the tin under a running tap, and a jet will flow from each hole. If you move your finger over the holes, the jets will join together. The water particles are attracted to one another and produce a tension. It is this force which holds a water droplet together. In our experiment, the force is particularly clear, and it diverts the jets into a sideways arch and knots them.

Water Puzzle

Lay a small tray or a wooden ruler over a six-sided pencil and place on it two jars filled with water, balanced as on a pair of scales. What happens if you emerge a cork into the water in one jar while placing a cork of the same size on the water in the other jar? Does one side of the balance become heavier, and if so, which side?

The balance leans to the side where you immerse the cork in the jar. That is, this side increases in weight by exactly as much as the weight of water displaced by the cork. The other jar only becomes as much heavier as the weight of the cork itself.

Volcano Under Water

Fill a small bottle full of hot water and color it with ink. Lower the bottle by means of a string into a preserving jar containing cold water. A colored cloud, which spreads to the surface of the water, rises upwards out of the small bottle like a volcano.

Hot water occupies a greater volume than cold because the space between the water particles is increased upon heating. It is, therefore, lighter and experiences buoyancy. After a period of time, the warm and cold water mix, and the ink is evenly distributed.

Suspending an Egg

Half fill a jar with water and dissolve plenty of salt in it. Now add as much water again, pouring carefully over a spoon, so the two liquids do not mix. An egg placed in the jar remains suspended as though bewitched in the middle. Since the egg is heavier than tap water, but lighter than salt water, it sinks only to the middle of the jar and floats on the salt water. You can use a raw potato instead of the egg. Cut a roundish magic fish from it and make fins and eyes from colored cellophane.

Mountain Water

Fill a dry glass with tap water without any overflowing. Slide coins carefully into the glass, one after the other, and notice how the water curves above the glass.

It is surprising how many coins you can put in without the water spilling over. The water mountain is supported by surface tension, as though it is covered by a fine skin. Finally, you can even shake the contents of a salt shaker slowly into the glass. The salt dissolves without the water pouring out.

How does it work?

Water molecules have a strong attraction for one another. Inside the glass, the molecules that are surrounded by other molecules are attracted in all directions. But the molecules at the surface have no water above them, so they are strongly attracted downwards by the molecules below them. These attractive forces are strong enough to keep the water from spilling over the top of the glass, even when the level rises quite a bit beyond it. But, eventually, the volume of water above the rim of the glass becomes too great for the surface tension to hold, and the water will spill.

Minipuzzler

What happens when you add a few drops of dishwashing liquid to the water in the glass? Can you add more pennies than before, or fewer?

Brainstorm in a group why soap and water help to clean things better than just water alone. Write down your ideas and share them with the class.

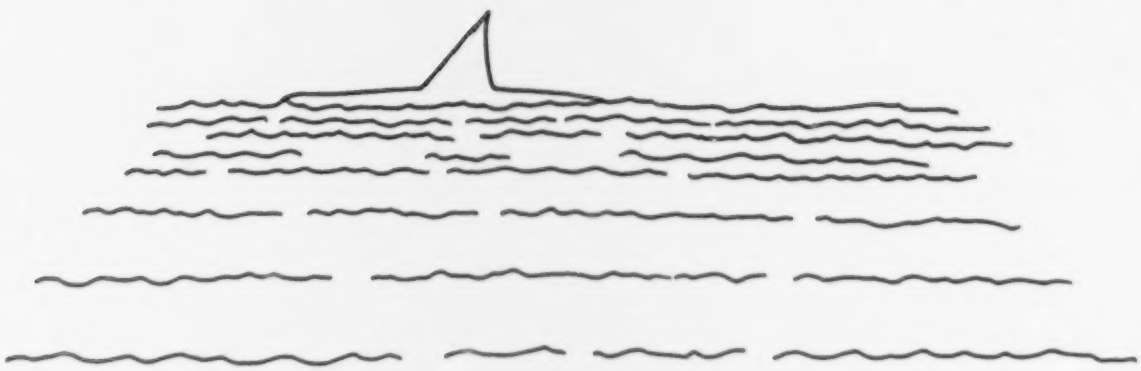
Music to Integrate Where Meaningful

Jaws theme

How Deep is the Ocean?

My Bonnie Lies Over the Ocean

Down by the Bay



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Resources for Water Mysteries

Loch Ness Monster

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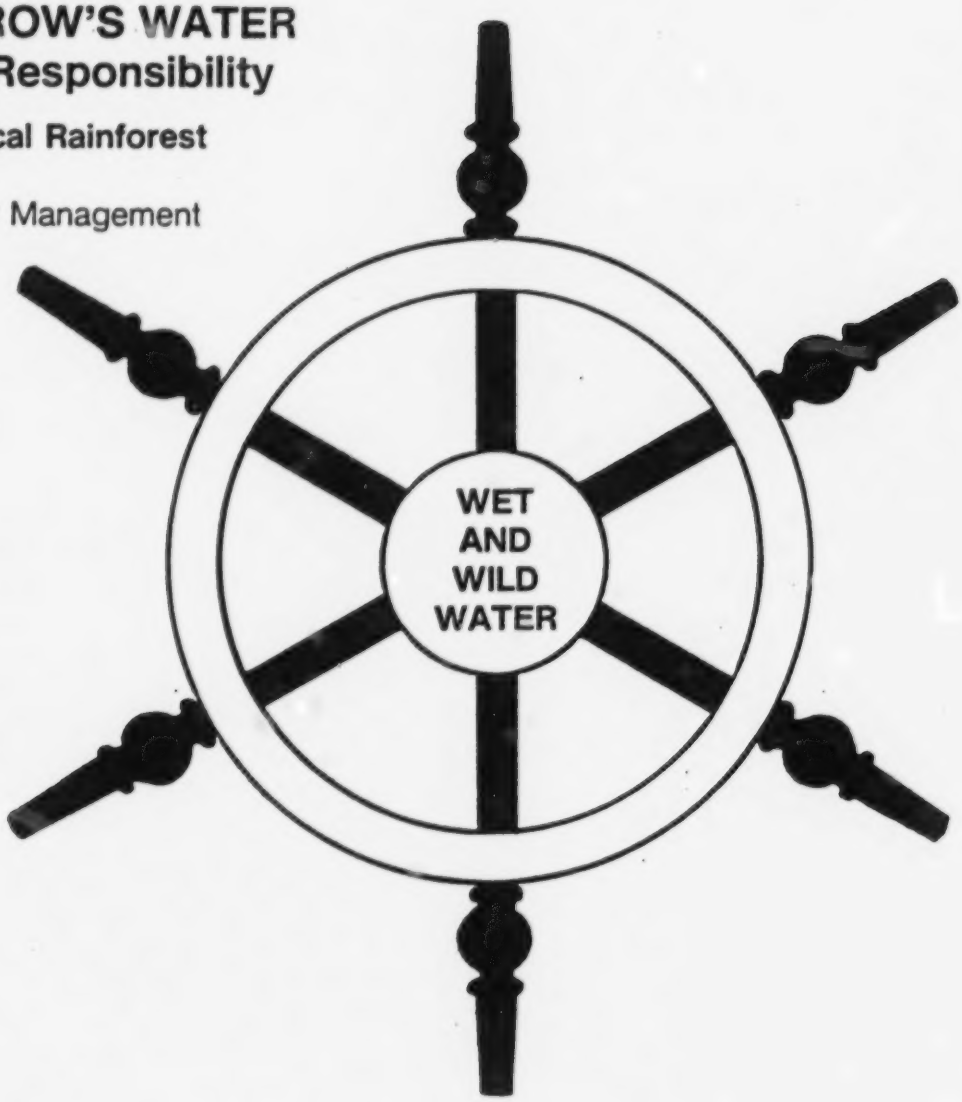
JOIN HANDS FOR TOMORROW'S WATER
Global Responsibility

Tropical Rainforest

Water Management



The rainforest needs us to have concern,
For all the things we need to learn
We don't want to lose touch,
The plants and animals mean so much,
Their life depends on you and me
If we all act responsibly.

JOIN HANDS FOR TOMORROW'S WATER
Global Responsibility

Introduction

Earth . . . the only planet in our solar system where water exists as a liquid in its natural state, is nicknamed "The Water Planet." Its position in relation to the sun is unique and essential in order to sustain life. If the planet was closer to the sun, water would boil and evaporate off the Earth; thus, eliminating any life forms on the planet. A distance farther from the sun would result in extreme cold temperatures - any water would be frozen solid. Again, no life would exist on the planet.

As inhabitants of this planet, we need to work together to maintain this delicate balance. Failure to do so will jeopardize the entire world population. The topics in JOIN HANDS FOR TOMORROW'S WATER will lead students to a better understanding and appreciation of the importance of water and its relationship to life on Earth.

CORE KNOWLEDGE
Tropical Rainforest Information for the Teacher

There are many kinds of tropical forests. Each type depends upon: latitude, altitude, soil type, drainage, annual rainfall.

These forests receive at least 60 inches of rain each year - some areas get up to 400 inches a year.

A forest that receives at least 100 inches of rainfall annually is commonly called a tropical rainforest.

Over one-half of all plant and animal life on Earth lives in tropical rainforests.

The average annual temperature of the world's tropical forests is 75 degrees Fahrenheit (24 degrees Celsius) and they never experience freezing temperatures.

There are nearly 12 hours of daylight every day of the year in the rainforest.

Temperature range: Daytime High 85 degrees Fahrenheit/ 30 degrees Celsius

Evening Low 70 degrees Fahrenheit/ 21 degrees Celsius

Jungle is a popular word for a tropical rainforest. It is from the Sanskrit word jungala which means "an impenetrable tangle of vegetation."

Rainforests are complex ecosystems made up of four environments; each with distinct animal and plant life:

1. **Emergent Level** - consists of trees ranging in height from 120 to 200 feet, wide temperature range, low humidity, strong winds, and constant exposure to the sun's rays. Examples of animal life include birds, insects, and arboveal mammals (mammals that have adapted to life in the trees, such as monkeys and flying squirrels, as well as lizards and snakes).

2. **Canopy** - consists of trees ranging in height from 75 to 90 feet. The canopy is so dense that 80 percent of the sun's rays are blocked from reaching the lower levels. It has a similar animal and plant population as the emergent level.

3. **Understory** - consists of small trees and shrubs varying in height from 10 to 20 feet. Many animals live in the understory in which the environment is one of diffuse light, high humidity, and stable temperatures.

4. **Forest Floor** - This is inhabited by plants and animals, most of which survive on the dead material that has fallen from the upper levels. Few green plants can survive since only 2 percent of the sun's rays reach the forest floor. The floor is covered with beetles, ants, termites, worms, centipedes, spiders, rodents, and some larger mammals.

Did you know?

We do not know how long rainforest trees live. Because the tropics do not have distinct seasons, the trees do not form clear annual growth rings.

One-third of the birds in the United States spend their winters in the rainforests of Central and South America. These birds include tanagers, orioles, flycatchers, king birds, warblers, mocking birds, vireos, grosbeaks, and buntings.

Some 7,000 medical compounds are derived from plants in rainforests. One-quarter of United States prescription drugs contain one or more of those compounds.

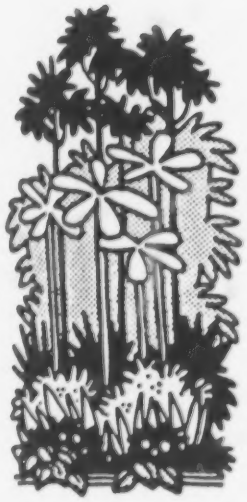
A single river in Brazil is home for more kinds of fish than all the rivers of the United States of America. One wildlife Preserve in Peru harbors more bird species than does the United States.

All plants, animals and microorganisms exchange gases with their environments and are, thus, directly or indirectly involved in maintaining the mix of gases in the atmosphere. Changes in that mix (caused by destruction of rainforests) can lead to rapid climate changes and, in turn, agricultural disaster.

Rainforests are the oldest biological communities on Earth. Their evolution has rolled on uninterrupted for 60 million years.

Problems of the disappearing rainforests include:

1. Logging
2. Deforestation for cattle ranching
3. Lack of protection for 95 percent of rainforest worldwide
4. Loss of species
5. Climatic changes
   a. greenhouse effect
   b. weather patterns
   c. desertfication
6. Loss of a fragile renewable resource
7. Loss of indigenous peoples and their traditions
8. Unwise, unpaid international loans for deforestation activities.



Tropical Rainforests are Disappearing at an Alarming Rate:

Every **SECOND**, we lose an area the size of 4/5 OF A FOOTBALL FIELD

Every **MINUTE**, we lose an area the size of TEN CITY BLOCKS

Every **DAY**, we lose an area the size of city of PHILADELPHIA

Every **YEAR**, we lose an area the size of PENNSYLVANIA

Every **10 YEARS**, we lose an area the size of the NORTHEASTERN UNITED STATES

Every **50 YEARS**, we lose an area the size of the United States EAST OF THE ROCKY MOUNTAINS

Benefits of the rainforest include:

1. Survival of many species
2. Prevention of climatic changes (greenhouse effect)
3. Preservation of indigenous cultures (an important link to understanding the rainforests)
4. Continued existence of many useful and potentially useful species found in:
   a. pharmaceuticals
   b. cosmetics
   c. building materials
   d. foods

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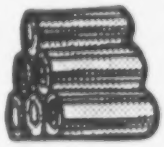
TROPICAL FOREST PRODUCE LIST

WOODS

Commonly used woods include: teak, mahogany, rosewood, and sandalwood

Tropical forest woods are used for:

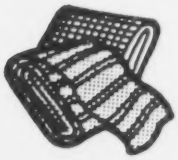


- doors
- doorframes
- windowsills
- flooring
- subflooring
- paneling
- veneer
- cabinetry
- joinery
- dresser drawers
- salad bowls
- garden furniture
- packing cases and boxes
- insulation
- general construction
- railroad ties
- wharf pilings
- boat building
- chemical vats
- buoyancy material
- drawing boards
- toys

HOUSEPLANTS

- Anthurium
  - Croton
- Dieffenbachia
  - Fiddle-leaf fig
  - Mother-in-law's tongue
  - Parlor Ivy
- Philodendron
  - Rubber Tree Plant
- Schefflera
  - Silver vase bromeliad
- Spathipyllum
  - Swiss cheese plant
  - Zebra plant

FIBERS



bamboo (furniture, baskets)
jute/kenaf (rope, burlap)
kapok (insulation, soundproofing, life jackets)
raffia (rope, cord, baskets)
ramie (cotton-ramie fabric, fishing line)
rattan (furniture, wickerwork, baskets, chair seats)

SPICES

allspice
black pepper
cardomom
cayenne
chili
cinnamon
cloves
ginger
mace
nutmeg
paprika
sesame seeds
tumeric
vanilla

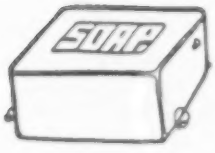
VEGETABLES AND OTHER FOOD

brazil nuts
cane sugar
cashew nuts
chayote
chocolate
coffee
cucumber
hearts of palm
macadamia nuts
manioc/tapioca
mayonnaise (coconut oil)
okra
peanuts
peppers
soft drinks (cola)
tea
vermouth (casscarilla oil)

FRUITS

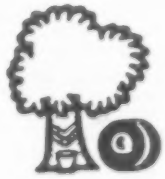
avocado
banana
breadfruit
coconut
durian
grapefruit
guava
jackfruit
lemon
lime
mango
mangosteen
orange
papaya
passion fruit
pineapple
plantain
rambutan
tangerine

OILS



bay oil (perfume)
camphor oil (perfume, soap, disinfectant, detergent)
cascarilla oil (confections, beverages)
coconut oil (suntan lotion, candles)
eucalyptus oil (perfume, cough drops)
guaic oil (perfume)
oil of star anise (scenting, confections, beverages, cough drops)
palm oil (shampoo, detergents)
patchouli oil (perfume)
rosewood oil (perfume, cosmetics, flavoring)
sandalwood oil (perfume)
tolu balsam oil (confections, soaps, cosmetics, cough drops)
ylang-ylang (perfume)

GUMS AND RESINS



chicle latex (chewing gum)
copaiba (perfume, fuel)
copal (paints and varnishes)
gutta percha (golf ball covers)
rubber latex (rubber products)
tung oil (wood finishing)

PHARMACEUTICALS (PARTIAL LIST)

Annatto (red dye)
Curare (muscle relaxant for surgery)
Diosgenin (birth control pills, steroids, asthma, and arthritis treatment)
Quassia (insecticide)
Quinine (anti-malarial, pneumonia treatment)
Reserpine (sedative, tranquilizer)
Strophanthus (heart disease)
Strychnine (emetic, stimulant)
Tuba root (rotenone, flea dip)

Activities to be used with The Study of Tropical Rainforests

Activity 1: Where are the Tropical Rainforests?

Proficiency/Indicator:

Science Use basic investigation skills in examining new events and ideas.

Materials: globe or world map, student copies of political outline world map, crayons, markers, incandescent desktop lamp, plastic two-liter pop bottle

Directions: RAINFOREST DEMONSTRATION

Pour about one cup of water into the soft drink bottle, close and place the bottle horizontally on a table. Position the lamp at the center of the bottle (be sure that the light is far enough from the bottle to prevent melting). The ends of the bottle should receive the least amount of light (see diagram below). The evaporation/condensation process should begin quickly, and within an hour, students should be able to see the results of the experiment.

Extended Activities:

1. Have the students observe the plastic bottle. Ask the following questions:

   What do you see inside the bottle? What do you think the climate would be like for a creature living at one end of the bottle? In the center?

   Why do you think the ends look different from the center?

   What do you think causes the water in the bottle to cling to the sides?

2. Explain that the bottle represents the Earth and the lamp represents the sun. Using the globe and the lamp, show the students how the sun shines on the Earth. Ask questions about the differences in temperature and climate around the globe and relate these questions back to the plastic bottle model.

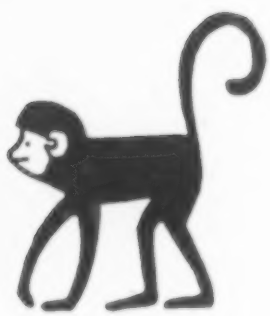
   What part of the globe will be the warmest? The coldest? The most humid?

3. Help students locate the equator on the map and the globe and explain the difference between a map and a globe. Point out the warmer areas of the Earth on the map based on the students' previous answers. Explain that tropical rainforests form a "green belt" around the center of the globe.

4. Distribute world maps to each student. They may wish to color the maps or do preliminary research about countries that have large rainforest areas.

5. Ask older students to identify a tropical rainforest country and write a report about that country including population, climate, economic situation, major exports, culture, and political organizations. In addition to libraries and museums, students should be encouraged to investigate ethnic restaurants for foods from tropical areas, to write to embassies, and to contact airlines that fly to these countries (these are often good sources of posters as well as good information).

6. Have students determine the distance of various tropical rainforests from their community.



Activity 2: Who Lives in the Rainforest?

Proficiency/Indicator:

Language Arts Think critically and reflectively through materials they read and materials that are read to them.

Materials: World map (political), student's individual copy of world map outline, rainforest map (included), "People of the Forest," "Pygmies of the Ituri" (included)

Directions: Locate and label the following cultures and their habitats on the map.

New World Tropics

Waura, Brazil
Erigbactza, Brazil
Lacandon, Mexico, and Guatemaula
Yanomami, Brazil, and Venezuela
Chow, Columbia
Kayapo, Brazil

Old World Tropics

Efe and Lese, Zaire
Kpelle, Liberia, and Guinea
Penan, Malaysia
Ashanti, Ghana
Kuba, Zaire
Lega, Zaire
Bakung, Indonesia
Akha, Thailand
Lua, Thailand
Gimi, Papua and New Guinea

Read about the Pygmies family in *People of the Forest.*

Compare and contrast Kebe and Alita's lifestyle with your own.

PEOPLE OF THE FOREST*

Deep in the African jungle, Kebe (KEH-bay) and his sister Alita (ag-LEE-ta) were traveling with their parents and several other families. They were looking for a place in the forest to build a new camp.

Finally, in a clearing near a small stream, the group stopped to set up camp. There was much to do. First each family needs a new hut. Ima (EE-mah), Kebe and Alita's mother, cut young trees and used them to make their hut. She bent the trees and wove them into a dome-shaped frame. Then she covered the frame with big leaves. The finished huts of all the families formed a circle in the clearing with all the doorways facing toward the center.

Kebe and Alita's father, Alukulu (ah-LOO-koo-loo), worked with the other men. They were making sure their bowstrings were tight and strong for the hunt the next day. Alukulu had told Kebe that he could join them on the hunt. Kebe was so excited, he could hardly wait.

When the sun came up the next morning, Kebe was the first one ready. The other boys and the men finally gathered their bows and arrows, and they all set off into the forest. Kebe knew they would probably find some small antelope called duikers (DYE-kerz). The Pygmies hunted other animals too, but most of the meat they ate came from these small, deer-like creatures.

After they'd been walking for a while. Alukulu and several other men moved ahead, formed a half-circle, and quietly waited. Then Kebe and the others spread out and began to march through the forest toward the waiting men with bows, beating the brush and shouting. The noise frightened animals straight toward the hunters, who shot them with their arrows. On the first try, Alukulu's arrow hit a duiker. Kebe was proud of his father's skill.

The hunters repeated their technique several times in other areas of the forest. Then they cut all the meat up, wrapped it in leaves, and divided it among themselves.

On their way back to camp, the hunters also collected other food, such as tortoises, fruit, birds' eggs, and even termites, snails, and caterpillars. As they walked, Alukulu noticed that many bees were going in and out of a hive high in the trunk of a huge tree. He knew that before too many days had passed, the group would be able to collect a special treat; honey.

While the men were out hunting, the women had been busy too, Although the men and boys in the group hunted for meat and gathered some other foods, it was the women and girls who gathered most of the foods the Pygmies ate, as well as the firewood they used for cooking the meals. Alita and all the girls and women in the group had important jobs, such as preparing the food, carrying water from the stream, and caring for small children.

Each day Ima, Alita, and the other women and girls searched for nuts, berries, mushrooms, roots, and firewood. Alita had made her own little basket and used it to help collect what she found.

Ima and Alita had gathered plenty of food for a good meal that night. When the hunters returned and Kebe brought their share of the duiker meat, Ima was pleased to add it to the other foods in her cookpot.

After the evening feast, the families gathered around the fires to chat. Then the men told the story of their hunt. Soon everyone began to sing and dance. Some people also played drums and other musical instruments. Many of the Pygmies danced late into the night. But Kebe and Alita were both exhausted from the day's work. They soon fell fast asleep, despite the noisy celebration.

Many days later, Alukulu decided it was the right time to collect honey from the bee hive he had found earlier. He led Kebe and some of the men to the honey tree. Kebe could climb trees like an expert, so he was chosen to raid the hive. Alukulu handed him a big knife and a leaf basket filled with burning bits of wood.

Kebe climbed high into the tree until he finally reached the hive. The smoke from the burning wood calmed the bees. He began to hit the tree truck with his knife. Whack! Whack! Whack!

Finally Kebe broke into the hive. He reached in and pulled out some of the honeycomb. Some of the bees stung him, but it was worth it - the honey tasted so good! Kebe threw down pieces of honeycomb, and the men caught them in huge leaves they held up. The men ate their fill. Then they took the extra honeycomb back to camp for the rest of the group to enjoy.

While the men and boys were collecting honey, the women and girls had been busy gathering food near the camp. Alita had decided to look for something special. She knew that opi (OH-pee) fruit ripened at the same time of year that the men collected honey. And she knew there was absolutely nothing better than opi fruit dipped in honey!

While Ima was collecting some mushrooms, Alita wandered off a little way until she came to one of the tall straight opi trees where lots of the dark fruit had fallen to the ground. She filled her basket full of the olive-like fruit, then ran quickly back to show her mother. Ima was proud of Alita. When Alita told everyone where the tree was, other families went to collect more opi fruit. What a treat they all had!

As the days passed, the Pygmy group found less and less to eat near their camp. That meant it was time to move on. Once again, Kebe and Alita's family walked off with the others to find a new place in the forest to camp. Kebe and Alita didn't have much to carry with them. They knew that the forest would provide whatever they needed.

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PYGMIES OF THE ITURI*

Deep, Dark Africa: Much of the Congo River basin in Zaire is relatively isolated and undisturbed. This part of equatorial Africa, which includes the Ituri Forest, represents a major portion of what's left of the world's tropical rainforests.

Forest People: Pygmies are one of various cultural groups that live in central Africa. Their characteristics, reddish-brown skin and small stature (they're about 4-4 1/2 feet tall), are two features that make Pygmies unique. Although there are several different groups of Pygmies, the story in this activity describes a subgroup of Mbuti (mm-BOO-tee) Pygmies called the Efe (EH-fay).

Finding Food: The Efe are hunter-gatherers, foraging for food in the wild instead of raising their own. Some associate with other groups that live in villages and cultivate crops. Though the Efe may work in their fields and trade meat and honey for cultivated foods and other goods, they have maintained their cultural identity. They are basically nomadic people, traveling from place to place as the forest's food supply fluctuates.

What's for Dinner?: The Efe are opportunists who take advantage of whatever the forest has to offer, whenever it is available. Occasionally they hunt large game, such as elephants, okapi, and buffalo. But they mostly hunt duikers, and sometimes monkeys, rodents, and birds. The women provide well over half of the food the Efe eat, either by collecting it in the forest or by working for it in villages. The Efe especially look forward to honey season. The incredible amount of honey the Efe consume during this brief season makes up a substantial portion of their total yearly calorie intake.

The Hunt: The Efe are bow-and-arrow hunters, and only the men and boys hunt. Sometimes hunting is a cooperative effort, as described in the story, and sometimes individual men hunt on their own. (Another group of Mbuti Pygmies uses nets to hunt, and men, women, and children all participate.)

A Way of Life: The Efe live in fairly small bands of several families. All the people in the camp share chores. But in general, the men hunt and collect honey, while the women fish, build huts, collect wood and water, gather and prepare food, and take care of children. Efe children develop "adult" skills as they play. Girls become skilled at their chores from about age three on, and boys begin hunting at about age nine or ten.

The Forest as Provider: The forest provides everything the Efe need to survive. It provides not only their food, but also their clothing in the form of bark, which they hammer into cloth and paint. The forest also shelters the Efe from the elements and provides materials for their homes.

The Efe keep very few possessions. They simply take what they need to survive from the forest. Their impact on the forest is minimal because their numbers are few and because they don't stay in any one place for very long.

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Activity 3: Spin a Tale

Proficiency/Indicator:

Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: *Anansi the Spider*, an Ashanti folktale

Directions: Read *Anansi the Spider* to the class.

Locate Ghana on the world map. (Ghana is where the Ashantis live in Africa.)

Possible Activities

a. Dramatize the story.

b. Make a book based on *Anansi the Spider*.

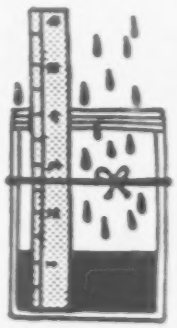
c. Create a new version of *Anansi the Spider*.

d. Study structures based on the strength of a spider web.

Extended Activities: Ask students to prepare a report on spiders.

Collect and share other African folktales Discuss how the rainforest plays a part in the setting, characters, and plot of the story.

Activity 4: How Much Rain Is That, Really?



Proficiency/Indicator:

Mathematics Collect, organize, display, and interpret data

Materials: Comparative rainfall chart (see next page)

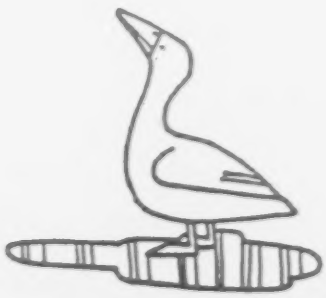
Directions: Using the information found on the comparative rainfall chart, create a graph, and/or demonstrate actual rainfall amounts with the students.

As a group, study the amounts and measure objects around the room and school yard that are similar in length.

Break into small groups and write 10 original story problems based upon the measurements.

COMPARATIVE RAINFALL
Normal Annual Precipitation

500	cm	200"	Choco Rainforest, Columbia
250	cm	100"	A typical rainforest
152	cm	59.7"	New Orleans, Louisana
123	cm	48.6"	Atlanta, Georgia
114	cm	44.8"	Houston, Texas
111	cm	43.8"	Boston, Massachusettes
110	cm	43.2"	Charlotte, North Carolina
109	cm	42.8"	New York, New York
99	cm	39.1"	Indianapolis, Indiana
99	cm	39.0"	Washington, District of Columbia
95	cm	37.4"	Portland, Oregon
86	cm	33.9"	St. Louis, Missouri
85	cm	33.3"	Chicago, Illinois
80	cm	31.7"	Toronto, Canada
67	cm	26.4"	Minneapolis, Minnesota
39	cm	15.3"	Denver, Colorado
38	cm	14.8"	Los Angeles, California



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Activity 5: Tropical Treats

Proficiency/Indicator:

Mathematics Estimate and measure using standard and nonstandard measure.

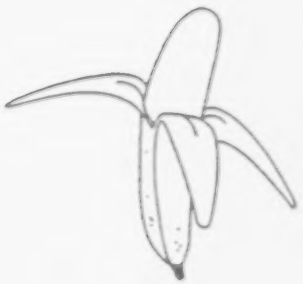
Materials: See next page for individual recipes describing ingredients and utensils.

Directions: Ask students to bring in specific items from selected recipes. Discuss how each ingredient can be related to the rainforest. Select a recipe and go to it!! Happy eating!!!

Extended Activities: You may want to compare/contrast your preparation of the food to that of the rainforest inhabitants.

TANTALIZING TROPICAL TREATS*

Jungle Punch



1 banana
1 cup orange juice
1 cup pineapple juice
1 can lemon-lime soda
1 pint lemon sherbet

Puree a soft, ripe banana in a blender. Add the orange juice and pineapple juice and blend together. Just before serving, add the lemon-lime soda and mix well. Put a spoonful of lemon sherbet in each glass and fill with punch. Makes about 1 quart.

Tropical Trail Mix

1 cup cashew pieces
1 cup peanuts
1 cup broken banana chips
1 cup chocolate chips
1 cup dried pineapple chunks
1/2 cup coconut flakes

Combine the ingredients in a large mixing bowl. Makes about two pounds. Note: You may want to add other tropical items if you can find them. Some possibilities include sesame seeds, Brazil nuts, dried papaya, and macadamia nuts.

RainForest Chip Dip

1 avocado
1 tablespoon lemon juice
1 small tomato
1 tablespoon grated onion
1/2 teaspoon of salt
1/4 teaspoon chili powder
3 tablespoons of mayonnaise
dash paprika
corn chips

Mash a soft, ripe avocado in a small bowl. Thoroughly mix in the lemon juice. Chop the tomato and add to the mixture. Blend in the onion, salt, chili powder, and mayonnaise. Sprinkle with paprika and serve with corn chips. Makes about 1 cup. Note: If you are making the dip ahead of time, spread the mayonnaise in a layer over the avocado mixture and refrigerate. Then blend in the mayonnaise when ready to serve. This will help prevent the avocado from discoloring.

South-of-the-Border Chocolate

1/2 cup cocoa
1/2 cup sugar
1 tablespoon instant decaffeinated coffee
1/4 teaspoon cinnamon
1 quart of milk
1 teaspooon vanilla
whipped topping
nutmeg

In a saucepan, heat the milk until it is hot, but not boiling. Mix together the cocoa, sugar, coffee, and cinnamon in a small bowl. Add two tablespoons of the hot milk to the chocolate mixture and stir the mixture until it is smooth. Blend the chocolate mixture into the remaining milk. Remove from heat, add vanilla, and beat the mixture with a wire whisk until it is frothy. To serve, fill cups with the hot chocolate, add a spoonful of whipped topping to each, and sprinkle with nutmeg. Makes about one quart.

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The Rainforest Revue

Putting on a variety show is a great way for students to share what they have learned about tropical rainforests and bring your study to closure. To get the class started, assign a different group to one of the performances printed under "The Rainforest Revue" on the next page. (See the "Performance Tips" below for ideas on how many to assign to each group.) Or let them choose which performances they would like to do. If you are working with older students, you may want to have them try creating their own songs, poems, or chants to add to the show.

Give students time to research their topics and to draw pictures and create props and costumes to use during the performance. Then have them put on "The Rainforest Revue" for the class and/or their parents.

PERFORMANCE TIPS

Narrator: You might want to split up the narration among several people, with each person being responsible for saying a different block of narrator copy.

"Jungle Rain" Group: This rhythmic chant works well with two or more students in charge of saying each verse and performing the corresponding movements.

"World Above the Ground" Group: Four to six students is a good number of performers for this song. You might want to have two or three sing the first two verses and two or three sing the last two, and then have all of them repeat the first verse. The audience and students who are not singing can shout the "echoing" phrases at the end of the first, second, and last lines of each verse.

"Day and Night in the Jungle" Group: Try having three pairs of students take turns saying two lines of this poem. For example, the first pair could recite the first two lines: "In the daytime, monkeys swing"; the next pair could recite, "Sloths cling, songbirds sing"; and so on until the end of the "daytime" verse. Then the first pair could start the "nighttime verse" by reciting the first two lines, followed by the next pair, and so on until the end of the poem.

"The Okapi" and "Blue Bird of Paradise" Groups: Any number of students can perform these limericks. You might want to suggest that some act out the animals while others recite the lines.

"The Leaf-Cutter Ants' Parade" Group: Either a small or large group can perform this song. But before they perform, have one or more of them talk about leaf-cutter ants and how the ants use leaves to grow fungus "gardens" for food. You may also want to have them add marching steps or other movements.

JUNGLE RAIN

Narrator: Ladies and gentlemen, welcome to "The Rainforest Revue." Today we will be taking you on a journey into the exciting and mysterious world of tropical rainforests - a world where it's warm and green year-round and where it rains nearly every day.

Drip, drop, pour, and patter
Plip, plop, spit, and spatter
Drizzle, drazzle, drain
Jungle rain

(snap fingers in rhythm)

Slip, slop, ripple, run
Trickle down, fall upon
Leaf and limb and flower
Jungle shower

(rub hands together in rhythm, getting faster)

Crash, smash, lightning flash
Raindrops splash, creatures dash
Sticky, steamy, warm
Jungle storm

(pat knees in rhythm, getting faster)

Rivers run, full and flowing
Plants are lush, green, and growing
Clouds begin to fizzle
Jungle drizzle

(rub hands together in rhythm, getting slower)

Sun comes out, shines and gleams
Scattered drops and rising steam
Are all that now remain
Of jungle rain

(all groups say - rhythms slow down and finally stop)

WORLD ABOVE THE GROUND

Narrator: All the rain and warmth in the rainforest means that trees and other plants are green and growing year-round. Many of the trees become giants, forming a thick layer of leaves, branches, and flowers high above the forest floor. This leafy forest covering, called the canopy, is loaded with life!

(Sing to the tune of "When You're Happy and You Know It")

In the jungle there's a world above the ground

(Above the ground! - say it out loud)

In the jungle there's a world above the ground

(Above the ground!)

Leaves and branches touch the sky
In the canopy so high
In the jungle there's a world above the ground

(Above the ground!)

The canopy is plush and lush and green

(Lush and green!)

The canopy is plush and lush and green

(Lush and green!)

Nearly 60 feet or more
Up above the jungle floor
The canopy is plush and lush and green.

(Lush and green!)

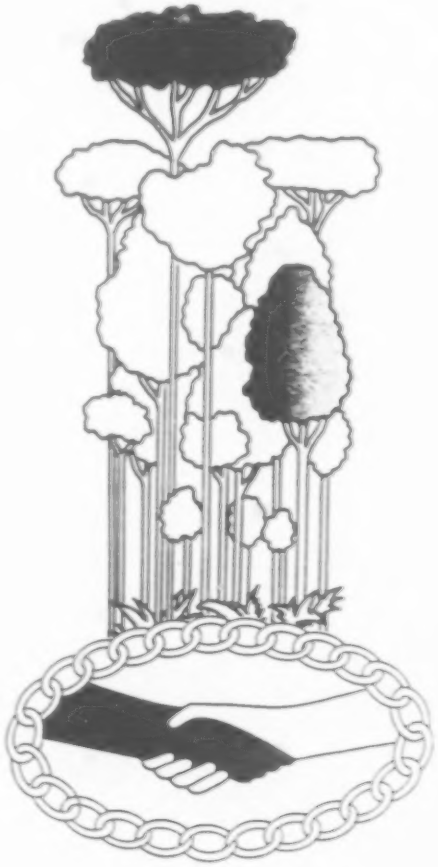
The canopy is home to many beasts

(Many beasts!)

The canopy is home to many beasts

(Many beasts!)

Some may never, ever go



To the forest floor below
The canopy is home to many beasts.

(Many beasts!)

They leap and climb and fly among the trees

(Among the trees!)

They leap and climb and fly among the trees

(Among the trees!)

Monkeys, spiders, sloths, and slugs
Frogs and snakes and birds and bugs
They leap and climb and fly among the trees.

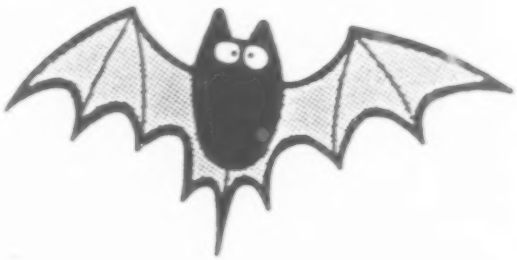
(Among the trees!)

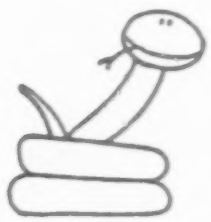
All groups repeat the first verse together.

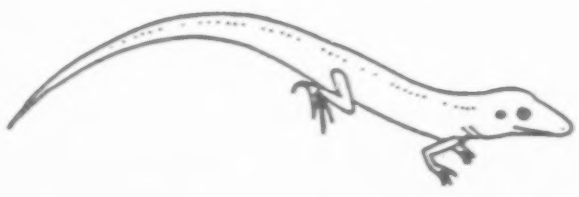
DAY AND NIGHT IN THE JUNGLE

Narrator: From the canopy to the forest floor, many different kinds of animals live in tropical rainforests. But not all of these animals are out and about at the same time. For example, some rainforest creatures are active during the day and sleep at night. Other rainforest animals sleep all day long and come out when it gets dark.

In the daytime
Monkeys swing
Sloths cling
Songbirds sing.
Orchids bloom
Insects zoom
Parrots chatter
Raindrops patter.
Snakes slide
Lizards glide
And nighttime creatures
Sleep and hide.
In the nighttime
Big cats grow!
Owls holler,
Hoot, and howl
Spiders crawl
Night birds call
Insects click
Crickets "crick."
Bats beep
Frogs leap
And daytime creatures
Hide and sleep.







THE OKAPI (oh-KAH-pee)

Narrator: Many scientists feel that some of the world's most interesting and beautiful animals live in rainforests. Did you know that rainforests are home to gorillas, toucans, orangutans, and all kinds of cats, bats, birds, insects, and other animals? Some of these species are so amazing it is hard to believe they are real.

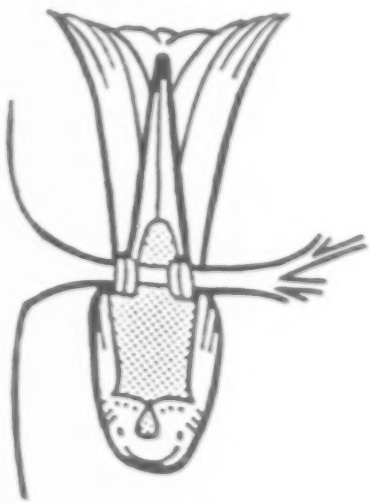
A strange animal is the okapi
With its stripes and its ears big and floppy.
It seems that whoever
Put it all together
Got tired or maybe just sloppy.

The okapi's a sight, but don't laugh -
It's a relative of the giraffe.
It eats leaves by the dozen
Just like its tall cousin,
But its neck is shorter by half.

BLUE BIRD OF PARADISE

Narrator: Ladies and gentlemen, we hope you have enjoyed our show! We hope you will help protect these special habitats so that there will always be rainforests full of marching ants, beautiful birds, incredible okapis, and all kinds of other fascinating creatures. Thanks for coming to our performance!

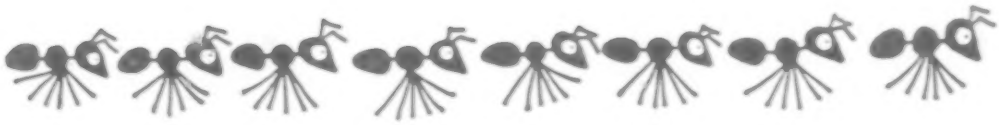
In far away jungles, I've heard,
Lives a strange and mysterious bird.
It hangs from a tree
Upside down, so you see -
Its behavior is truly absurd.
This jungle bird puts on a show;
It shimmies and shakes to and fro
It jostles and jiggles,
It waggles and wiggles,
Its long, silky plumes seem to glow.
You may wonder just why it should be
That a bird acts so strange -
Well, you see,
It hangs from a tree
Because it's a he
And he wants to impress a she.



THE LEAF-CUTTER ANTS' PARADE

(Sing to the tune of "When Johnny Comes Marching Home")

The ants go marching back and forth
Hooray, hooray!
The ants go marching south and north
Hooray, hooray!
The ants go marching east and west
Looking for leaves to take back to their nest
And they all go marching -
The leaf-cutter ants' parade.
The ants go marching day and night
Hooray, hooray!
The ants go marching, what a sight
Hooray, hooray!
They munch and they crunch and they bite and they tear
Cutting up leaves that they find here and there
And they all go marching -
The leaf-cutter ants' parade.
The gardens are growing underground
Hooray! hooray!
The gardens are growing underground
Hooray! hooray!
The gardens are growing underground
All over the leaves that the leaf-cutters found
And they all go marching -
The leaf-cutter ants parade.



BRANCHING OUT: TROPICAL ENCORES
(Extend Rainforest Revue Activities)

Here are two other tropical rainforest performance ideas for intermediate and advanced groups:

Yanomamo: Named after the largest remaining tribe of indigenous rainforest people in South America, the musical "Yanomamo" focuses on many of the causes and consequences of deforestation. Commissioned by the World Wildlife Fund/United Kingdom, "Yanomamo" is a series of songs with accompanying narration. For information on ordering the musical score and cassette tape of "Yanomamo," write to the Customer Service Department of Boosey and Hawkes, Inc., 52 Cooper Square, 10th Floor, New York, NY 10003-7102.

The Tamarin Trickster: This play is about the golden lion tamarin, a tiny endangered monkey that lives in the Atlantic coastal forest of Brazil. Originally performed by school children in Brazil, the play has been translated and adapted for North American audiences. You can find out more about "The Tamarin Trickster" and about tamarin captive breeding efforts by writing to the Office of Education, National Zoo, 3001 Connecticut Avenue, Northwest, Washington, DC 20008.

Activity 6: How Fast are Tropical Rainforests Disappearing?

Proficiency/Indicator:

Mathematics Demonstrate computational skills with whole numbers!

Materials: Use the chart below.

HOW FAST ARE TROPICAL RAINFORESTS DISAPPEARING?

Every **SECOND**, we lose an area the size of 4/5 OF A FOOTBALL FIELD

Every **MINUTE**, we lose an area the size of TEN CITY BLOCKS

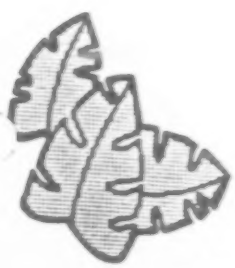
Every **DAY**, we lose an area the size of city of PHILADELPHIA

Every **YEAR**, we lose an area the size of PENNSYLVANIA

Every **10 YEARS**, we lose an area the size of the NORTHEASTERN UNITED STATES

Every **50 YEARS**, we lose an area the size of the United States EAST THE ROCKY MOUNTAINS

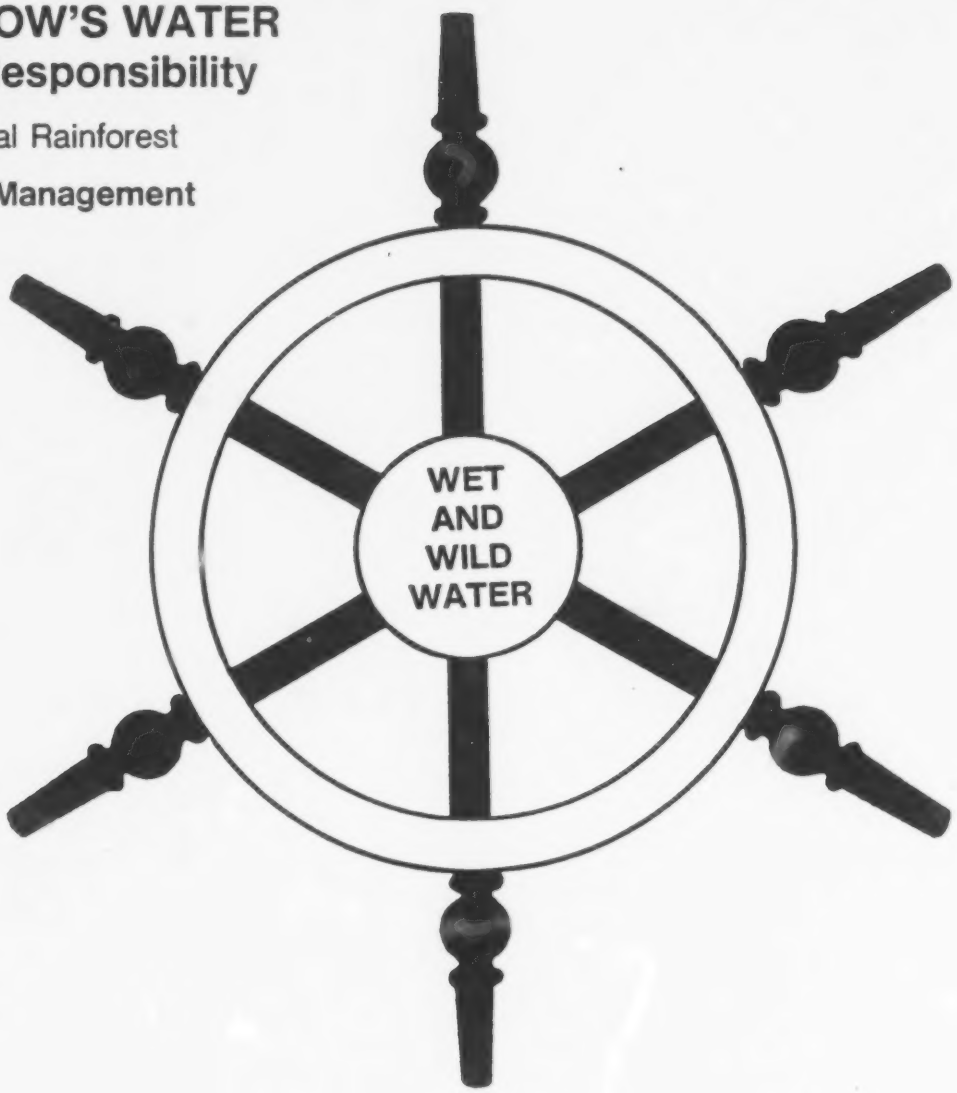
1. Discuss the deforestation chart above with the class.
2. Go outside on the playground and mark off an area 4/5 the size of a football field. (Approximately 80 yards x 40 yards)
3. If possible, continue your measurement by walking a portion of a ten city block area. Perhaps you could incorporate tropical rainforest scavenger hunt – look for rainforest products tires, balls, etc., as you walk.
4. Make up story problems based on the chart. For example: how long does it take to lose enough rainforest area the size of 40 city blocks?



JOIN HANDS FOR TOMORROW'S WATER
Global Responsibility

Tropical Rainforest

Water Management



THE SEA

Behold the wonders of the mighty deep,
Where crabs and lobster learn to creep,
And little fishes learn to swim,
And clumsy sailors tumble in.

Anonymous

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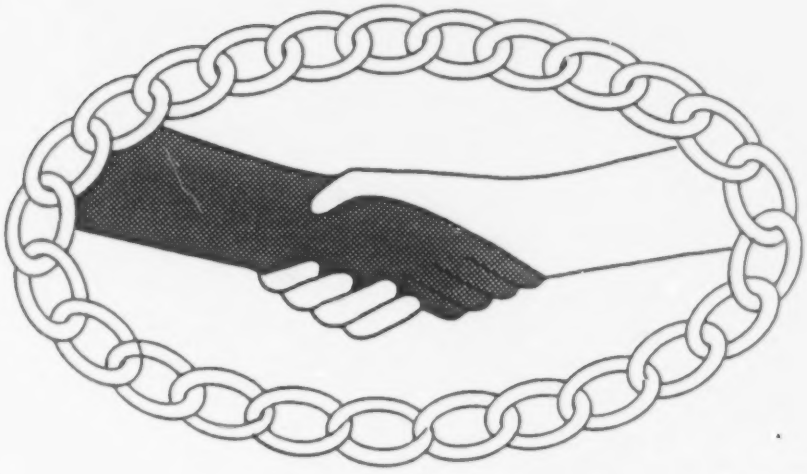
CORE KNOWLEDGE:
Water Management



Water use is such an automatic and habitual daily activity that students often do not understand the consequences of its use.

A model that traces the dynamics of water is called the water cycle. The water cycle involves the path of water from when it falls in the form of rain or other precipitation on a watershed; to its travel as runoff that flows into streams, groundwater systems, lakes, reservoirs, estuaries, and oceans; to its eventual return to the atmosphere through evaporation and evapotranspiration; to its formation into clouds; to its condensation in the form of precipitation as it again falls on a watershed in this continuing process. The great storehouses of water – glaciers and icecaps – are also part of this cycle. All forms of life on Earth are dependent upon and affected by this cyclical journey of water.

In between the watershed and the sea, we divert the water from its natural course for our own uses. Water for domestic purposes is the most obvious use in our lives. About eight percent of total water use in the United States is domestic. Much more is consumed for agricultural purposes (33 percent) and industrial/commercial uses (59 percent) (United States Geologic Circular 1001). Human uses of water have dramatic effects on wildlife. Each time we draw water from its natural setting or modify the natural journey of water, we are likely to have an impact on wildlife and wildlife habitat. For example, building dams floods river and stream valleys. Draining wetlands removes water from natural nurseries for wildlife. Once water is diverted from its natural path and used by humans, it is often contaminated or polluted. If contaminated water is returned to human habitats or to wildlife habitats, the effects may be devastating. Salinity from irrigation that damages soil's productivity; nutrient loading in lakes receiving runoff from agricultural fertilizers and pesticides; toxic chemicals seeping into human and wildlife water supplies are all examples of forms of contamination that can enter the water cycle with damaging consequences for people, wildlife, and the environment.

We have a variety of choices in terms of how we use water, and how we treat water. In our own lives, we can make decisions to use water as a part of our daily lifestyle. Conservation of water not only reduces or prevents destruction of natural habitats by lessening the need for dams and other interventions; it also reduces the depletion of underground water stores which supply moisture for many riparian and other habitats. Conservation of groundwater supplies also benefits human populations that depend upon underground aquifers for municipal water supplies. For example, such conservation can slow the depletion of the groundwater supplies and, at times, help to regenerate such supplies. Groundwater is the water we do not see - it is the water that is under the ground. Conservation of both groundwater and surface waters protects the continued availability of water for humans, wildlife, and the environment. Conserving water is one action we can take. We can also pay attention to what we put into water and the water cycle - being careful with potential toxins like pesticides, detergents, fertilizers, motor oils, aerosols, cleaning fluids and powders, and caustic acids; as well as fuels and their byproducts. Humans can affect both the quantity and quality of available water through our personal and public conservation practices.

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How You Use Water

Direct Personal Use - Eight percent of the nation's total, or 160 gallons per person, per day, is used for personal and home activities:

Average Amount of Water Required	Activity
3 to 5 gallons	Flushing a toilet
3 gallons	Shaving with a blade, leaving the water running
5 gallons per minute	Take a shower
8 gallons	Cooking (three meals)
8 gallons	Cleaning house
10 gallons	Washing the dishes (three meals)
20 to 30 gallons	Washing clothes
30 to 40 gallons	Taking a bath

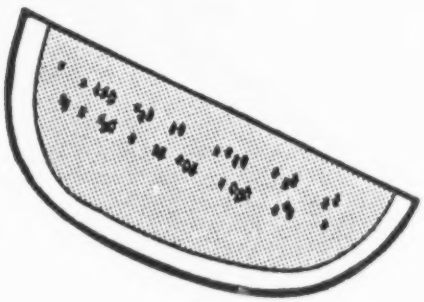
Agricultural Use - About 33 percent of the nation's total, or 600 gallons per person, per day, is used in farm and ranch operations.

Average Amount of Water Required	Food Produced
40 gallons	One egg
80 gallons	One ear of corn
150 gallons	One loaf of bread
230 gallons	One gallon of whiskey
375 gallons	Five pounds of flour
2,500 gallons	One pound of beef

Industrial Use - About 59 percent of the nation's total, of 1,040 gallons per person, per day, is consumed in the production of material goods.

Average Amount of Water Required		Product
7 to 2 gallons		One gallon of gasoline
35 gallons		One pound of steel
280 gallons		One Sunday newspaper
300 gallons		One pound of synthetic rubber
1,000 gallons		One pound of aluminum
100,000 gallons		One new car

NOTE: About 720 gallons per person, per day is used as cooling water for electrical power plants.



DRINKING LORE

The average human has about 50 quarts of water in his or her body. Most of this water is found between the cells, bathing and lubricating them. The wettest part of the body is the blood, which is 83 percent water, while the driest is tooth enamel, which contains 2 percent water.

Among animals, the amount of water in the body usually depends on the conditions of a habitat. Desert-dwellers survive with less water than marine animals. The kangaroo rat (which lives in the desert) is about 65 percent water. A jellyfish is about 95 percent water. Some others: chicken, 74 percent; lobster, 79 percent; earthworm, 80 percent.

A baked sunflower seed, contains only about 5 percent water, and is the driest food consumed by humans. Watermelon, at 97 percent, is the wettest.

SPOTLIGHT ON IRRIGATION

Irrigation is the watering of land by artificial methods. It provides water for plants grown in areas that have long periods of little or no rainfall. The water used for irrigation is taken from lakes, reservoirs, rivers, streams, and wells.

Irrigation is a *consumptive use* of water. Plants take in water through their roots. They then pass it out through their leaves into the air as a gas called *water vapor*. Winds carry away the vapor, and the liquid water is gone.

The use of water in our home is a *nonconsumptive use*. Nearly all the water is carried by sewer pipes back to rivers and can be used again.

Irrigation is used chiefly in three types of climates:

1. In desert regions, such as Egypt and the southwestern United States
2. In regions with seasonal rainfall, such as California and Italy
3. In moist regions, such as the eastern United States and western Europe

The amount of water needed for farming varies with the type of crop and the climate. For example, rice requires more water than cotton (more information on rice is located at the end of this section). Wheat grown in a warm climate needs more water than wheat that grows in a cool climate. (It takes 115 gallons of water to grow enough wheat to bake a loaf of bread.) Irrigation accounts for more than 40 percent of the water used in the United States.

The United States uses about 110 billion gallons of water a day for irrigation. This is enough water to fill a lake five miles long, one mile wide, and 100 feet deep.

In some countries, more water is used for irrigation than for any other purpose. Irrigation requires large supplies of fresh (unsalt) water from both surface water and ground water sources.

Surface water is water on the surface of the Earth, such as in streams, rivers, and lakes. *Ground water* is stored beneath the Earth's surface in spaces between rocks, grains of sand, and other substances in soil.

There are four general methods of applying irrigation water:

1. surface irrigation
2. sprinkler irrigation
3. trickle irrigation
4. subirrigation

Surface Irrigation

This is the most common method of irrigation, it is used on about 80 percent of the irrigated land in the United States. In surface irrigation, the farmer runs water over the surface of the field. There are two chief types of surface irrigation: *flood irrigation* and *furrow irrigation*.

Flood irrigation covers the entire surface of a field with water, which soaks into the soil. Small soil wall called dikes or *levees* hold the water on the field. In many farms, the dikes divide the field into sections, and the farmer floods each section individually.

Flood irrigation works best on leveled land. The soil should be deep and able to hold a large amount of water. This method is generally used on crops of oats, rice, wheat, and other grains.

Furrow irrigation requires that crops are planted in rows, such as corn, cotton, and potatoes, are irrigated by water from narrow ditches called *furrows*. In this type of irrigation, rows of furrows are dug across field. The farmer then plants seeds in the ridges between the furrows. As water enters the furrows, it seeps into the ridges. Furrow irrigation is used on many kinds of soil and terrains.

Sprinkler Irrigation

This system provides water through pipes that lie on or are mounted above the ground. It became popular with the development of inexpensive plastic and aluminum pipe in the 1940s. In sprinkler irrigation, a pump forces water through a pipe to nozzles called *sprinkler heads*.

The sprinkler head distributes water to the crops in the form of a spray or moisture. In most cases, the farmer can move the pipe to irrigate the entire field.

Sprinkler irrigation can be used on most crops and soils and on level or rolling terrain. It provides an efficient means of irrigating farms that have a small supply of water. However, sprinkler systems require large amounts of energy, and so their use is limited to areas with ample energy supplies.

Trickle Irrigation

This method is also called *drip irrigation*. It furnishes water through plastic tubes that lie on or under the ground. The tubes have small openings called *emitters* at points corresponding to the location of the plants. As water flows through the tubes, it trickles out of the emitters into the soil. Only the soil directly around the plants receive moisture. As a result, trickle irrigation wastes little water.

Trickle irrigation can be used on all crops, soils, and terrains. Its efficient use of water makes it ideal for areas with small water supplies. But the high cost of installing and maintaining trickle irrigation makes it impractical for most farming. The method generally is used only for higher value crops such as fruits and vegetables.

Subirrigation

This method applies water from beneath the roots of plants. The water comes from ditches or underground pipes, and the surface of the ground remains dry. Subirrigation requires a water tight layer of soil or rock below the plant roots. Water collects above this layer and moistens the roots.

Irrigation and Rice

Rice is the principal food of at least one-half of the people in the world.

Rice is more important to the crowded countries of the Far East than bread and potatoes are in North America.

In normal times, each person in southern and eastern Asia consumes between 300-400 pounds of rice per year - about a pound a day!

The farms of Asia raise more than 250 million tons of rice a year (90 to 95 percent of the world's rice).

The People's Republic of China is the world's largest leading rice producer, followed by India, Japan, and Indonesia.

Rice is grown in every country of the western hemisphere except Canada.

Texas, Arkansas, Louisiana, and California are the leading producers of rice in the United States.

Rice needs a great deal of water and a long, warm growing season. Most varieties require four to six months from planting to harvesting.

There are two types of rice: upland and lowland rice.

Upland rice (also called dry rice) is grown without irrigation where rainfall is plentiful.

Lowland (or wet) rice is raised in fields flooded with two to eight inches of water.

Most of the world's rice is lowland rice.

Brown rice (rice with the germ and outer skin intact) is 7.5 percent protein, 1.8 percent fat, and 76.7 percent carbohydrate. It is also rich in thiamine (vitamin B1) and minerals.

White rice (rice which has been milled by machine and polished) is stripped of most of its thiamine, minerals, and fat.

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Activities to be used with The Study of Water Management

Activity 1: Hamaguchi's Sacrifice

Proficiency/Indicator:

Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: *The Burning of the Rice Fields*
Lafcadio Hearn
(see next page)

Directions: Read the story to the class.

Brainstorm possible ways for students to "get people's attention" focusing on the problem of water pollution.

Create posters, raps, songs, etc., to promote public awareness towards water conservation.

THE BURNING OF THE RICE FIELDS*
Lafcadio Hearn

Far away in Japan, many years ago, lived good old Hamaguchi. He was the wisest man of his village, and the people loved and honored him.

Hamaguchi was a wealthy farmer. His farmhouse stood on a hillside high above the seashore. Down by the shore, and scattered up the hill, were the houses of his neighbors. Around his own house, the ground was flat, like the top of a huge step in the hillside, and all about him stretched his rice fields.

It was the time of harvest. Hundreds of rice stacks lined Hamaguchi's fields. It had been a fine harvest, and tonight down in the village everyone was having a good time.

Hamaguchi sat outside his house and looked down into the village. He would have liked to join the other villagers, but he was too tired - the day had been very hot. So he stayed at home with his little grandson, Tada. They could see the flags and the paper lanterns that hung across the streets of the village, and see the people getting ready for the dance. The low sun lighted up all the moving bits of color below.

It was still very hot, though a strong breeze was beginning to blow in from the sea. Suddenly the hillside shook - just a little, as if a wave were rolling slowly under it. The house creaked and rocked gently for a moment. Then all became still again.

"An earthquake," thought Hamaguchi, "but not very near. The worst of it seems far away."

Hamaguchi was not frightened, for he had felt the earth quake many a time before. Yet he looked anxiously toward the village. Then, suddenly, he rose to his feet and looked out at the sea. The sea was very dark, and, strange to say, it seemed to be running away from the land.

Soon all the village had noticed how the water was rolling out. The people hurried down to the beach. Not one of them had ever seen such a thing before.

For a moment, on the hillside, Hamaguchi stood and looked. Then he called, "Tada! Quick - very quick! Light me a torch!"

Tada ran into the house and picked up one of the torches that stood ready for use on storm nights. He lighted it and ran back to his grandfather. Quickly the old man grabbed the torch and hurried to the rice fields. Tada ran with him, wondering what he was going to do.

When they reached the first row of rice stacks, Hamaguchi ran along the row, touching the torch to each stack as he passed. The rice was dry, and the fire caught quickly. The seabreeze, blowing stronger, began to drive the flames ahead. Row after row, the stacks caught fire. Soon flames and smoke towered up against the sky.

Tada ran after his grandfather, crying, "Grandfather, why? Why?"

Had his grandfather gone mad? Why was he burning the rice that was their food and all their wealth? But Hamaguchi went on from stack to stack, till he reached the end of the field. Then he threw down his torch and waited.

The bell-ringer in the temple on the hill saw the flames and set the big bell booming. And, down on the beach, the people turned and began to climb the hill. If Hamaguchi's rice fields were afire, nothing would keep them from helping him.

First up the hill came some of the young men, who wanted to fight the fire at once. But Hamaguchi stood in front of the fields and held out his hands to stop them.

"Let it burn," he ordered. "Let it burn."

Soon the whole village was coming. Men and boys, women and girls, mothers with babies on their backs, and even little children came. Children could help pass buckets of water.

Still Hamaguchi stood in front of his burning fields and waited. Meanwhile the sun went down.

The people began to question Tada. What had happened? Why wouldn't his grandfather let them fight the fire? Was he mad?

"I don't know," cried Tada, for he was really frightened. "Grandfather set fire to the rice on purpose. I saw him do it"

"Yes," cried Hamaguchi. "I set fire to the rice. Are all the people here now?"

The villagers looked about them. Then they answered, "All are here, but we do not understand –"

"Look!" shouted Hamaguchi, as loud as he could. He was pointing to the sea. "Look! Now do you think I have gone mad?"

All turned and looked toward the sea. Far, far out, where the sea and sky seem to meet, stretched a cloudy line that came nearer and nearer. It was the sea coming back to the shore. But it towered like a great wall of rock. It rolled more swiftly than a kite could fly.

"The sea!" screamed the people. Hardly had they spoken, when the great wall of water struck the shore. The noise was louder than any thunder. The hillside shook. A sheet of foam was dashed far up to where the people stood.

When the sea went back, not a house was left below them on the hillside or along the shore. The whole village had been swept away.

The people stood silent, too frightened to speak. Then they heard Hamaguchi saying gently, "That is why I set fire to the rice . . . My house still stands, and there is room for many, the temple on the hill still stands. There is shelter there for the rest."

Then the people woke, as if from a dream, and understood. Hamaguchi had made himself poor to save them, and they bowed their foreheads to the ground before him.

QUESTIONS

A. What do you think caused the huge wave?

B. Why do you think Hamaguchi set fire to his fields rather than trying to get the villagers' attention another way?

C. What do you think Hamaguchi and the villagers will do now?

D. In what way did Hamaguchi show that he was wise?

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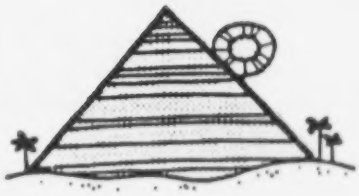
Activity 2: Abdul, Where Does Your Garden Grow?



Proficiency/Indicator:

Social Studies Explain how people make choices about using goods, services, and resources tos satisfy their economic wants.

Materials: Direct instruction information:

Three climates where irrigation is commonly found:

1. Desert regions - Egypt and southwest United States
2. Seasonal regions rainfall - California and Italy
3. Moist regions - eastern United States and western Europe

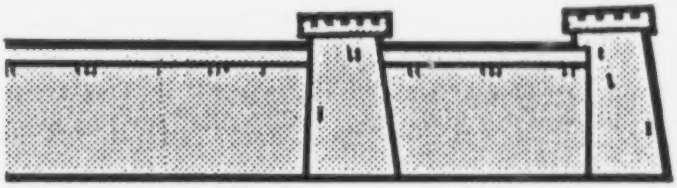
Directions: Discuss the three climates and locate these areas on the world map.

In small groups, research and list crops that are grown in these three climates.

Extended Activities: Take a field trip to the supermarket in your community to identify agricultural products that come from irrigated regions around the world.

Interview the store manager about products that come from irrigated regions.

Activity 3: Chop Chop



Proficiency/Indicator:

Language Arts Respond actively and imaginatively to the literature they encounter.

Materials: Chop sticks, wedding rice bags

Directions: Research how the chopsticks, wedding rice bags, and other customs originated. Dramatize it in a short skit.

Extended Activities: Bring chop sticks in and practice eating rice with them.

Activity 4: Mice Love Rice

Proficiency/Indicator:

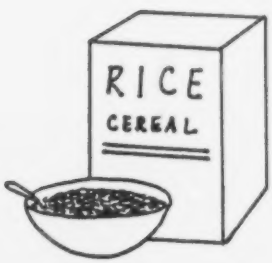
Language Arts Write for different purposes and audiences using a variety of forms.

Materials: Paper, pencil

Directions: Compose a poem or story that rhymes with rice. You may begin by brainstorming rhyming words on the overhead or board (example, rice, twice, thrice, mice, slice, spice, etc.).

Extended Activity: Use food coloring, glue, and rice to design rice mosaic to illustrate your poem or story.

Activity 5: Wake up to Rice



Proficiency/Indicator:

Language Arts Develop independent reading strategies and adapt them to the particular contexts, purposes for reading, choices of materials, and stance toward the materials.

Materials: Boxes of breakfast cereals that contain rice.

Directions: Evaluate the different rice cereals by graphing the results.

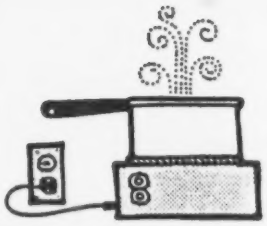
a. taste

b. appearance

Read and share the ingredients, price, and where they were packaged. Discuss what determines the price and where the rice may have come from.

Extended Activity: Prepare a rice snack with the class - Rice Krispies® Squares, Chex Party Mix, YUM!!

Activity 6: What's Cooking?



Proficiency/Indicator:

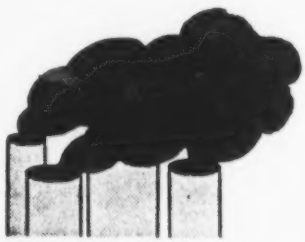
Science Using basic investigation skills in examining new events and ideas.

Materials: Rice, water, measuring cups, and cooking facility

Directions: Prepare a cup of rice for the class to measure. How many cups of cooked rice are produced from one cup of raw rice? Compare taste, color, texture, and size. Graph your results.

Extended Activity: Estimate the weight of a cup of rice before and after cooking. Estimate the number of grains of rice in a small container.

Activity 7: Deadly Waters



Proficiency/Indicator:

Mathematics Collect, organize, display, and interpret data.

Materials: Construction paper, Pollutant Information Sheet (included)

Directions: Explain to the students how water, if polluted, could have long lasting effects that could prove fatal to many living organisms, including humans. Students analyze the pollutants found in a hypothetical river. They graph the quantities of pollutants and make recommendations about actions that could be taken to improve the habitat.

Before the activity begins, make 100 tokens of each of the ten colors of construction paper. The construction paper may be folded in quarters to speed up the process of cutting or punching. For younger students, cut the construction paper into one-half inch squares using a paper cutter. For older students, punch out construction paper tokens with a paper punch. Put all the tokens, either one-half inch squares or punched tokens, in a container. Stir them so the colors are thoroughly mixed. Make one copy of the Pollutant Information Sheet for each student.

List the four major categories of pollution on the chalkboard and discuss each. They are: chemical, thermal, organic, and ecological. Refer to the background for a description of each. NOTE: The first three are dominantly caused by humans, although there are rare cases where natural processes can cause them. Ecological pollution is typically natural, although there are cases where it is caused by humans.

Pass out the Pollutant Information Sheets. Review each kind of pollution with the students. Talk about how some of these can fit into more than one of the four kinds of pollution. Color code each with a different color of construction paper. Write a short description of the pollution on a piece of paper of the color to which it is coded. (Some teachers have simply copied the Pollutant Information Sheets, cut the descriptions apart, and pasted the appropriate paragraphs on each of the colored sheets of paper.) Post each sheet of colored paper with its corresponding description of the kind of pollution it represents in a row in a convenient place.

Once all the kinds of pollution have been discussed, and the students understand that each kind of pollution will be represented in this activity by one color of paper, tell the students that they are to divide into teams of three. These will be research teams; each team will analyze the pollution content of a hypothetical river. Distribute the colored paper tokens that have been cut or punched from the construction paper. Provide one-fourth teaspoon of the paper-punched tokens or one tablespoon of the cut one-half inch square tokens, to each research team with a piece of graph paper.

The teams must separate the colored tokens into piles; using the color key, they should identify each type of pollutant. Once this is done, they should count the number of each kind of pollutant they have identified and then use graph paper to construct a simple bar graph showing the whole array of pollutants. Arrange the pollutants in the same order as they are displayed in the color key that is posted in the classroom. This makes it easy to compare each team's findings. Remind them that each has a different river. Their results are not likely to be the same!

When they have the bar graphs completed and have compared the teams' results, tell them that any quantity above two units of each kind of pollutant is considered damaging to wildlife habitat. In their hypothetical rivers, what pollutants would be likely to cause the most damage to wildlife and wildlife habitat? Give examples and discuss the kinds of damage that could be caused.

Optional:

Invite the students to match the pollutants with the four categories of pollution listed at the beginning of the activity. Some seem to fit rather easily; others could fit in more than one category, depending on the source of the pollution. For example, is the thermal pollution human or naturally caused (power plant water effluent or thermal hot springs)?

Extended Activities:

List five things you can do – starting today – in your own life to reduce the number of pollutants you add to the environment.

Conduct a field trip to a local waterway and attempt to identify what, if any, kinds of pollution are affecting it.

Get information about current national and state laws protecting water quality in the United States. Write a short history of the United States Clean Water Act.

Why is DDT still being used, and where? Find out the current status of this pesticide use in the United States and other parts of the world.

Pollutant Information Sheet

Sediments

Particles of soils, sand, silt, clay, and minerals wash from land and paved areas into creeks and tributaries. In large unnatural quantities, these natural materials can be considered pollutants. Construction projects often contribute large amounts of sediment. Certain lumbering practices affect sediments in runoff. Sediments may fill stream channels and harbors that later require dredging. Sediments suffocate fish and shellfish populations by covering fish nests and clogging the gills of bottom fish and shellfish.

Petroleum Products

Oil and other petroleum products like gasoline and kerosene can find their way into water from ships, oil drilling rigs, oil refineries, automobile service stations, and streets. Oil spills kill aquatic life (fish, birds, shellfish, and vegetation). Birds are unable to fly when oil loads the feathers. Shellfish and small fish are poisoned. If it is washed on the beach, the oil requires much labor to clean up. Fuel oil, gasoline, and kerosene may leak into ground water through damaged underground storage tanks.

Animal Waste

Human wastes that are not properly treated at a waste treatment plant and then released to water may contain harmful bacteria and viruses. Typhoid fever, polio, cholera, dysentery (diarrhea), hepatitis, flu, and common cold germs are examples of diseases caused by bacteria and viruses in contaminated water. The main source of this problem is sewage getting into the water. People can come in contact with these microorganisms by drinking polluted water; also by eating fish or shellfish from, or swimming in, this water. Often unexpected flooding of barnyards or stock pens can suddenly increase the toxic effects of animal waste in water. Animal waste can also act as a fertilizer and create damage by increasing nutrients. (see Fertilizers)

Organic Wastes

Domestic sewage treatment plants, food processing plants, paper mill plants, and leather tanning factories release organic wastes that bacteria consume. If too much waste is released, the bacterial populations increase and use up the oxygen in the water. Fish die if too much oxygen is consumed by decomposing organic matter.

Inorganic Compounds

Detergents, pesticides, and many synthetic industrial chemicals are released to waterways. Many of these substances are toxic to fish and harmful to humans. They cause taste and odor problems and often cannot be treated effectively. Some are very poisonous at low concentrations.

Inorganic Chemicals

Inorganic chemicals and mineral substances, solid matter, and metal salts commonly dissolve into water. They often come from mining and manufacturing industries, oil field operations, agriculture, and natural sources. These chemicals interfere with natural stream purification; they destroy fish and other aquatic life. They also corrode expensive water treatment equipment; and increase the cost of boat maintenance.

Fertilizers

The major source of pollution from agriculture comes from surplus fertilizers in the runoff. Fertilizers contain nitrogen and phosphorous that can cause large amounts of algae to grow. The large algae blooms cover the water's surface. The algae die after they have used all of the nutrients. Once dead, they sink to the bottom where bacteria feed on them. The bacterial populations increase and use up most of the oxygen in the water. Once the free oxygen is gone, many aquatic animals die. This process is called eutrophication.

Heated or Cooled Water

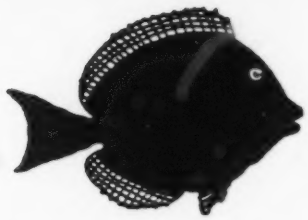
Heat reduces the ability of water to dissolve oxygen. Electric power plants use large quantities of water in their steam turbines. The heated water is often returned to streams, lagoons, or reservoirs. With less oxygen in the water, fish and other aquatic life can be harmed. Water temperatures that are much lower than normal can also cause habitat damage. Deep dams often let extra water flow downstream. When the water comes from the bottom of the dam, it is much colder than normal.

Acid Precipitation

Aquatic animals and plants are adjusted to a rather narrow range of pH levels. The pH value is a measure of the acidity of a solution. When water becomes too acidic, due to inorganic chemical pollution or from acid rain, fish and other organisms die.

Pesticides, Herbicides, Fungicides

Agricultural chemicals designed to kill or limit the growth of life forms are a common form of pollution. This pollution results from attempts to limit the negative effects of undesirable species on agricultural crop production. Irrigation, groundwater flow, and natural runoff bring these toxic substances to rivers, streams, lakes, and oceans.



Activity 8: Something's Fishy Here

Proficiency/Indicator:

Language Arts Listen and respond for a variety of purposes.

Materials: One copy for each student of the story entitled, *Something's Fishy Here?* (included) .

Directions: .

The students will have an opportunity to address issues that will directly affect their lives. This activity will give them a chance to become aware and possibly solve these problems.

Have each student silently read the story or read it aloud to them.

After the students have all finished, discuss the story with them. Ask the students to think about as many different endings to the story as possible. OPTIONAL: Ask each student to write an ending for the story.

In small groups, ask the students to share their own recommendations for how the story should end.

Ask each group to decide on the ending they most prefer. If they cannot agree, that is okay. Have each group report aloud for all the other groups to hear which ending or endings they recommend. List the essential points of each ending on the chalkboard.

Discuss the various endings with the entire class. Identify cause and effect relationships. Look for possible relationships between the story and problems regarding water use and aquatic habitats that might or do exist in the students' own community.

Next have the students generate a list of possible aquatic wildlife problems related to aquatic pollution that they believe do exist in their own environment. Have them form groups that have a common interest in one or more of the problems and develop a plan to find out more about the problem. Once they have targeted a problem, have each group report back to the class. Decide on one problem and work on it as a class.

NOTE: Coach the students to choose problems that they might actually solve. For example, pollution in a nearby brook is far more realistic for them to address than an entire river system. Remember, it is important that students be able to experience some success in developing the plan and tackling the problem.

If several groups were each working on a separate problem, ask the class to vote on the problem they would most like to address. Assure them that their choosing one does not make the others less important. It is useful for all to get behind one effort. Remind the students to develop an attitude *for* a clean environment. Have them seek solutions rather than place blame.

Once a specific issue is chosen, have the class list ten things that can be done to make that problem less damaging to aquatic wildlife.

Facilitate the class taking specific action, by helping them develop a plan to implement. Establish a time line and specific assignments.

Extended Activities:

Follow through on the plan to initiate environmental action to reduce the negative consequences of aquatic pollution in the community.

Continue working on the other issues on the list.

Find a way to publicize what the class has done. Contact broadcast media, the city council, garden clubs, parent-teacher association, etc.

Work to raise interest among other students to address additional important aquatic wildlife and habitat-related issues.

Name three types of aquatic pollution. Identify the pollution source. Describe some of the problems caused by each of these kinds of pollution. Water is taken from a river, treated, used by people of a community, sent to a city sewage treatment plant, and put back into the river. Is this aquatic pollution? Defend your response. Sam Smith and Jill Jones each caught their fishing line on a dead tree in a stream. They could not get their line loose, so cut off about 15 feet of line. Is this aquatic pollution? Defend your response.

Describe two actions that you and your classmates can take to have a clean and healthy environment.

Something's Fishy Here?

Charlie and Alex were true friends of the "forever" type. Rarely on different wave lengths, they lived as neighbors and played together in the same coastal community for all their young lives. Both were in fifth grade.

Spring fever attacked them with equal intensity, usually right before their school's spring vacation. This particular spring, they planned to liven up the Annual Pet Show with an unusual entry. Charlie (whose name was short for Charlotte) and Alex were going to produce a "surprise" entry - some crayfish!

For many springtimes the friends had regularly captured and observed these interesting creatures. Both loved the lively and fascinating crayfish. They both learned how to handle the animals with no harm to themselves or the crayfish. They could watch the crayfish for hours in the aquarium they made for them and then return them to their habitat, unharmed. The supply was seemingly endless. Winning the prize for "Most Unusual Pet" was guaranteed.

Planning their adventure was easy as they walked from school. Charlie would bring the nets; Alex the containers with covers.

Their science class was dealing with the subject of environmental protection. Both students liked the topic so when it was announced, Charlie and Alex gave each other the eye. Not much of a problem here in our community, they agreed. Anyway, their minds were drifting somewhere away to their secret stream. They had dreams of zillons of crayfish crawling all over the pet show poodles, birds, and fabulous felines. They could hardly wait to go to the stream.

As they walked down the woods trail, the familiar smells inspired the explorers as they anticipated their adventure. All the signs were there; the ground flowers had bloomed by the path, the willow buds were bursting, and green fuzz crowded the understory. It was "crayfish time" for sure!

They made their way down to the banks of the stream, near the deep water pools and around the grassy rock ledges . . . what anticipation! Charlie crept into the shallow water and started to probe in the rocky bottom to get the crayfish moving toward Alex. Alex was net-ready. Their adventure began to lose its luster when Charlie noticed several of the crayfish not moving at all. In fact, they were dead! In moments the companions were looking bewildered; there were more than a couple that were dead, there were hundreds!

It took a few moments to register. They forgot what this would mean for the pet show. They felt genuine concern. These fascinating animals that had provided them with hours of enjoyment were all dead! Bewilderment, puzzlement. What could have happened? It was moments before the team was working again. They both recognized at once that there was a mystery to be solved!

What would "Encyclopedia Brown" have done under similar circumstances? Right! Look for clues! Forget the "jokes," this is important stuff right here. Hundreds of crayfish don't keel over from fear of being over-exposed in public at a pet show!

There has to be a really strong reason. The explorers determined to discover what it was.

A quick glance over the surrounding area revealed little evidence of foul play. Alex did note that there was a condition common to all the dead crayfish. They were sticky to the touch. They seemed to be coated with soapy substance. Charlie saw the foamy suds first. The suds clung to the rocks above the falls. The students went further upstream searching for more signs. Beyond the falls the suds were sparse. Then they noticed that on the flat marsh where the stream meanders from the town, there were none of the common spring flowers. Charlie noticed this because she had planned to decorate the biggest crayfish with a garland of violets, but none were to be found. Another moment of sadness. Where were the violets? Closer to town the stream flowed through a gorge of sandstone embankments. Beyond this a new blacktopped parking lot signaled the edge of the town, sporting a brand new mini-shopping center. There they discovered something new. Under fresh packed soil, tucked beside the fence, storm drains were partially buried. They were opened to allow flow of water into the streams. That night at dinner Charlie and Alex consulted with Charlie's sister. She had a great sense of how things worked and always seemed ready to help these younger explorers. She advised mapping the area of the new shopping center and identifying the stores in the area that might have soap in their waste water.

Alex and Charlie sat down and compiled a list of the shopping center's stores. They produced several possibilities - The Ritz Cleaners, The Wash and Dry Laundromat, Sparkie's Car Wash, and Johnny's Auto Body. They decided to record observations on a daily basis for a week. They agreed to take turns looking for evidence. (Good detectives keep records, not patterns, and follow trails before they draw conclusions or make accusations.)

One evening when it was Charlie's turn to observe, her mother drove her to the shopping center. What she found out caused her to call Alex at once. Her voice rang with excitement. "We've got 'em!" she cried. "When Mom drove me to the center we drove over a bump in the parking lot near the car wash. They have big black hose running into the drain pipe. They connect it after dark! I saw it - I know it! They let it flow into the storm drains from their storage tanks. That's where the soap is coming from! We gotta do something Alex! Where do we go? What do we do!? Who can we trust!?". . .

Activity 9: Alice in Waterland

Proficiency/Indicator:

Language Arts Use a variety of techniques to express thoughts and feelings and to respond to others.

Materials: One Water Use Information sheet per student (see sample); several long sheets of butcher paper for murals; art materials for the murals (poster paints, vivid pastels or chalks, etc.)

Using guided imagery, ask the students to sit quietly, close their eyes, and imagine that they could shrink down to a size that would let them travel up through their faucet and into their water pipes. NOTE: You may want to adapt the text of this imagery so it will apply to local settings. Or, if many of the students have well water as their domestic source, you can convert the imagery to a school setting. Even if this imagery does not apply exactly to the students' situation, it can be used to explore a typical source of water and its routes in this country. Ask the students to visualize in their minds what you will describe for them in the following words.

"Imagine that you are small enough to climb into the faucet in your kitchen . . . Pretend you have magic powers that allow you to travel through the water that comes from the faucet to its origins . . . You are able to pass through all the pipes, valves, and other barriers on the way . . . The first part of the journey takes you through the pipes in your house to your water source . . . If you live on a farm or ranch, the source would probably be a well or perhaps a spring. In the city, the water source for your home probably would be far away . . . First you get into water main . . . Then you come to a pumping plant where water pressure is maintained . . . Past the pumping plant is a place where the water is purified . . . This may be very complex – a place with filters, chemical tanks, and treatment equipment . . . Beyond the purification plant, the water may be in an aquaduct or open channels coming from a reservoir . . . The reservoir is a huge lake where water is stored . . . There are often trees and bushes on its edges . . .Wildlife is common, fish are usually abundant, and people often use the site for recreation . . . Natural streams usually flow into the reservoir . . . They drain large areas of the land's surface which are called watersheds . . . A watershed is the land area that catches and transports water through streams, underground flow, and rivers . . . The water in a watershed contains all the water that is naturally available for use by all living things in that area . . . If you want, stay in the watershed. Try to see the plants and animals that live in the area.

Or, follow your route all the way back through the reservoir and channels and treatment plant and pumping plant to the water main tand he pipes into your house and out your faucet. Then, open your eyes."

After this imagery, discuss the journey of the water from its source to the faucet. Identify the components of the journey. Emphasize the places where wildlife habitats are affected - positively, negatively, or with unknown effects - by the intervention of people as they use the water or influence how the water is to be used.

Have the students create a mural on a single long sheet of butcher paper, depicting the origins and journey of water from their home to its source. Have them emphasize wildlife and habitat all along the way.

Repeat the imagery process for a journey down the drain into the waste water system:

"Imagine you are small again. This time the journey will be down the drain in your sink. You move along through the used water system to a treatment site . . . If you live on a farm, the site probably will be a septic tank . . . A septic tank is usually a large concrete box . . . Here bacteria break down the substances carried in the water . . . Once the water is cleansed to the degree possible, it flows out through drainage fields and back into ground water sources or streams . . . If you live in a city, there is much more water being used and large water treatment plants must attempt to cleanse the water before it is returned to rivers and streams . . . In these treatment plants, there are great filters and holding tanks . . . The water must be held in place for solid substances to settle out by gravity . . . Air is often pumped through the waste water to increase the oxygen content so bacteria can break down the impurities more quickly . . . Eventually the treated water is released into rivers and streams . . . It reenters the natural habitat for wildlife . . . There it provides an essential component for continued life . . . If all was done well, animals, plants, and humans will safely reuse the water . . . It will nourish the crayfish caught by the raccoon . . . It will provide the pond for the box turtle . . . It will provide the refreshing drink for someone like yourself in some downstream city . . . After you have followed the water out into the environment, open your eyes."

Repeat the discussion and create a downstream mural. Include places where humans and wildlife are affected - positively, negatively, or with unknown effects - by the reentry of this water into the hydrologic cycle.

Look at the entire mural – upstream and downstream. Identify, list, and discuss places in which the quality of the water in the water cycle may be affected by human activities, not just the quantity of available water.

Now shift the emphasis to the amount of water most people typically use. Pass out Water Use Information sheets. See the master provided.

Ask the students to keep track of how much water is used in their homes for five days. Suggest that the sheet be posted on the refrigerator and that each family member help by putting a mark in the section designated on the sheet after each water use. The miscellaneous section is for special uses not listed above.

After the water-use data have been gathered, make a master chart that summarizes the total use in the class members' homes for the entire week. Discuss places where water use might be conserved. Challenge each student to intentionally reduce his or her water use, and invite their families to join in. Have them monitor use for another five day period and tabulate the results.

Once the results are tabulated, discuss how wildlife, habitat, and humans can benefit from human water use conservation. Discuss the potential appropriateness and effectiveness of a variety of water conservation behaviors. Examine the concept of trade-offs by considering potential negative, as well as positive effects. Discuss more than ways to reduce and conserve water use – also discuss ways to protect the quality of the water we use. List and discuss actions that each of us can take to reduce or prevent a variety of toxins or pollutants from entering the hydrologic cycle.

WATER USE INFORMATION
(all values are approximate)

3-5 gallons	flushing a toilet
3 gallons	shaving and letter the water run
5 gallons per minute	shower
8 gallons	cooking three meals
8 gallons	cleaning house
10 gallons	washing dishes (3 meals)
20-30 gallons	washing clothes
30-40 gallons	watering a lawn
30-40 gallons	taking a bath
30-40 gallons	washing a car

Extended Activities:

Water use conservation also saves money unless you have your own water supply (a well). Calculate how much money your family would save in water and energy bills if you carried out conservation practices for a year.

Monitor water use in the school. Identify ways to conserve water use in the school.

Take field trips to water purification systems and waste water treatment plants.

Modify the murals to show the effects of water conservation and improved water quality on wildlife habitat.

Create a poster campaign for raising the awareness in the community about water conservation and water quality.

Create a Water-Waste-Enders team and charge them with identifying water wasters in the community. Have them devise a way to encourage the wasters to change their practices. Give credit to the successful Water-Waste-Enders who change their practices!

Design a closed-loop water system for a space station.

Draw and label a flow chart tracing water in your community from where it comes – to your home – to where it goes after it leaves your home.

Estimate the number of gallons of water you use each day for personal use. What do you do that uses the greatest amount of water in a year? Name three ways you might conserve water. How much water could you conserve using each method for a year? How appropriate will other people think your water-conservation actions are? How might wild animals be affected by your water-conservation actions? How might plants be affected?

Order the following water uses according to those which use the most water to those which use the least in the United States: domestic, industrial, agricultural/irrigation, recreational (1 = most).

What effect, if any, does human water use have on animals that live on the land? What effect, if any, does human water use have on animals that live in or around water? Give examples of ways that water quality can be affected negatively by human use. Give examples of actions people can take to protect the quality of water.

Water Experiences for Join Hands for Tomorrow's Water

1. Within a ten minute interval, find and record the animals and plants that depend on water for survival.

2. After a gentle rain, have students observe and record evidence that the rain water stayed on the school site (rain drops, moisture in ground, puddles, wet grass).

3. Have students list reasons why water is important to their health (write ideas on board or tape record them).

4. Draw pictures showing how they use water.

5. Take a trip to the local water treatment plant to observe and investigate how water is purified and treated.

6. Define the term "watershed." Discuss drainage patterns noted during rain. List the various kinds of precipitation which supply water to the shed, (i.e., rain, snow, sleet).

7. Locate on a map the sources of water for their community. Explain in a class play how the water cycle benefits the watershed.

8. Explain how people manipulating the environment have affected the source and quality of water supply for the watershed, i.e., compare the runoff from paved area or large building to a grassy or natural area of the same size.

9. Construct a series of food chains found in the watershed. Example: Plant - tadpole - snake - bird.

10. Write a short story depicting life in the year 2,000 after man has destroyed all food chains within the local watershed. (Example: all plants die.)

11. Ask the county surveyor or city engineer for a drainage map. Locate the school on the map. Draw a map tracing water supplies form the school to its source. Draw a map which shows how water reaches the school. On the map, indicate where runoff water and sewage go after it leaves the school. Have students follow their map to the point where the runoff water and sewage is discharged. Have them list the advantages and disadvantages of the present system.

12. Explain how the local water supply is treated and how this treatment affects the health, economics, and recreation potential of the community. Interview the county sanitarian about the local water supply to determine:

    a. What are the problems?

b. What are projected needs?

c. Is the water treatment expensive?

Photograph or collect pictures which demonstrate how water is used in the community.

a. In what ways is water being misused?

b. Make suggestions for reducing consumption of water?

Survey the school and community to determine how wisely water is being used.

a. Develop a water use plan for the school.

b. Develop a water use plan for each home.

Suggested Music for Join Hands Across Tomorrow's Water

Jaws Theme

Rain Drops Keep Falling on My Head
B. J. Thomas

Stormy Weather

Bridge Over Troubled Water

Rain
The Beatles

Resources for Join Hands for Tomorrow's Water

Reference Books

Science With Young Children, Revised Edition, Bess-Gene Holt, Washington, D.C., 1989.

Blueprint for a Green Planet, John Seymour and Herbert Girardet, New York, Prentice Hall, 1987. Truly

The Main Who Planted Trees, Jean Giono, Chelsea, Vermont, Chelsea Green Publishing Co., 1985.

Natural History, M. B. Goffstein, New York, Farrar, Straus, Giroux, 1979.

Bringing the Rain to Kapiti Plain, Verna Aavdema, Dial Press, 1981.

Anansi the Spider: (A Tale from the Ashanti), Gerald McDermott, Holt, Rinehart, and Winston, 1972.

The Big Wave, Pearl S. Buck, Harper and Row, 1948.

The Burning of the Rice Fields, Lafcadio Hearn, Houghton-Mifflin, 1983.

Dreams of Amazonia, Roger D. Stone, Viking Press, 1985.

The Enchanted Canopy, Andrew W. Mitchell, Macmillan, 1986.

In the Rainforest, Catherine Caulfield, Knopf, 1985.

The International Book for the Forest, Simon and Schuster, 1981.

Life Above the Jungle Floor, Donald Perry, Simon and Schuster, 1986.

The Life and Mysteries of the Jungle, edited by Edward S. Ayensu, Crescent, 1980.

The Life of the Jungle, Paul W. Richards, McGraw-Hill, 1970.

People of the Tropical Rain Forest, edited by Julie Sloan Denslow and Christine Padoch, University of California Press, 1988.

The Primary Source: Tropical Forests and Our Future, Norman Myers, Norton, 1984.

Rain Forests and Cloud Forests, Michael Emsley, Abrams, 1979.

Saving the Tropical Forests, Judith Gradwohl and Russell Greenberg, Earthscan, 1988.

Tropical Nature, Andrew Forsyth and Kenneth Miyata, Charles Scribner's Sons, 1984.

Animals in Danger: Forests of Africa, compiled by Gill Gould, Rourke, 1982.

Animals of the Tropical Forests, Sylvia A. Johnson, Lerner, 1976.

A Closer Look at Jungles, Joyce Pope, Gloucester, 1978.

Disappearing Rainforests, Robert Prosser, Dryad, 1987.

Journey Through a Tropical Jungle, Adrian Forsyth, Simon and Schuster, 1988.

The Jungle, Carroll R. Norden, Raintree, 1988.

Jungles, Andrew Langley, Bookwright, 1987.

Jungles, Illa Podendorf, Children's Press, 1982.

Jungles, Angela Wilkes, EDC, 1980.

The Jungles: A Science Activity Book, Puffin, 1987.

Nature Hide and Seek: Jungles, John Norris Wood and Kevin Dean, Knopf, 1987.

Rain Forest Homes, Althea, Cambridge University Press, 1985.

The Rainforest Children, Margaret Pittaway, Oxford, 1980.

The Tropical Forest, Mary Batten, Crowell, 1973.

Where the Forest Meets the Sea, Jeannie Baker, Greenwillow, 1987.

Wonders of the Jungle, edited by Victor H. Waldrop, National Wildlife Federation, 1986.

National Geographic, volume 176, number 5, November 1989, "The Efe: Archers of the Rain Forests," pages 664-686.

Time, Volume 134, Number 12, September 18, 1989, "Play With Fire," pages 76-85.

Newsweek, Volume CXIV, Number 12, September 18, 1989, "Alaska After Exxon," pages 50-62.

Audio/Visual

Rain Forest Rap, (Intermediate and Advanced), produced by the World Wildlife Fund, is a six-minute video set to rap music. It shows the problems facing tropical rainforests, and how kids can help. It is available from the Publications Department OB, World Wildlife Fund, 1250 24th Street, Northwest, Washington, DC 20037. This video can also be order as part of a teacher's kit.

Sounds of a Tropical Rain Forest in America, is a record available from Carolina Biological Supply Company, 2700 York Road, Burlington, North Carolina 27215.

Tropical Kingdom of Belize, (Advanced) a video by the National Geographic Society, depicts the many habitats of Belize including tropical rainforests. Write to National Geographic Society, Educational Services, Department 89, Washington, DC 20036.

The Tropical Rain Forest Set, (All Ages) contains slides and a booklet with background information. "Tropical Rain Forests Under Fire" (Intermediate and Advanced) is a filmstrip with activity booklet and narrative cassette. Both are available from Educational Images Limited, P O Box 3456, West Side, Elmira, NY 14905.

Voices of the Peruvian Rain Forest, is a cassette available from Cornell University Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850.

Why Are the Forests Disappearing, (Intermediate and Advanced) is a video available from Agency for Instructional Technology, Box A, Bloomington, IN 47401.

Wildlife in the Jungles of Latin America, (Intermediate) is a film available from International Film Bureau, Inc., 332 South Michigan Avenue, Chicago, IL 60604.

Other Activity Sources

Global Tomorrow Coalition has created a "Global Issues Education Packet on Tropical Forests" (Intermediate and Advanced) that contains background information, activities, and ready-to-copy sheets. They also have "A Tropical Forest Walk," a 15-minute cassette of forest sounds with script. For more information on these items, write: Coordinator, GTC Education Services, 25422 Trabuco Road, #105-440, ElToto, CA 92630-2797.

Marine World Africa USA has a teacher's guide with activities about rainforests for grades K-12. Included are worksheets, puzzles, flashcards, and conservation tips. Send your requests to Marine World Africa USA, Marine World Foundation, Marine World Parkway, Vallejo, CA 94589.

National Association for the Advancement of Humane Education offers a teaching unit on rainforests. It contains a teacher's guide and suggested activities, including a board game and a "touch" table. For more information, write to NAAHE, P O Box 362, East Haddam, CT 06423.

National Audubon Society has a poster on tropical forests along with a teacher's guide suggesting activities to use with the poster (Intermediate and Advanced). They also have "International Issues Fact Sheet's" that focus on tropical forests. Available from National Audubon Society, 645 Pennsylvania Avenue, Southeast, Washington DC 20036.

Vanishing Rain Forests (All Ages) is an educational packet produced by the World Wildlife Fund to accompany the Smithsonian Institution's traveling exhibit, "Tropical Rainforests: A Disappearing Treasure." The packet contains a video, full-color poster, background information, and teacher's guide with rainforest activities. For more information, write Publications Department OB, World Wildlife Fund, 1250 24th Street, Northwest, Washington DC 20037.

Organizations

Educators for Social Responsibility. 23 Garden Street, Cambridge, MA 02138. Presently working on curricula for science and environmental education.

Greenpeace. 1638 R Street Northwest, Washington, DC 20009. Combines and unites environmental and anti-military activity.

Nuclear Information and Resource Service. 1616 P Street Northwest, Washington. DC 20036. Just what its title indicates.

Sierra Club. 730 Polk Street, San Francisco, CA 94109. Starting with an interest in the natural world, they are concerned with the threat from military and other sources.

Union of Concerned Scientists. 26 Church Street, Cambridge, MA 02138. This group has a great deal of information on the greenhouse effect.

Indiana and National Resources

PROJECT WILD
Aquatic Education Activity Guide

Contact: Warren Gartner
Project WILD
6013 Lakeside Boulevard
Indianapolis, IN 46278
(317) 290-3223

THE OUTDOOR CLASSROOM

Contact: Joe Wright
Office of School Assistance
Center for School Improvement and Performance
Indiana Department of Education
Room 229, State House
Indianapolis, IN 46204-2798
(317) 232-9141

RIVERS AND WILDLIFE RESOURCE GUIDE

Contact: National Audubon Society
613 Riversville Road
Greenwich, CT 06831

The Indiana Department of Education appreciates the assistance and support of the Izaak Walton League of America in helping design this water resource module for middle grant educators and students. If you have specific questions about water quality monitoring or obtaining equipment, please contact:

Karen Firehock
Save Our Streams Kits and SPLASH Newsletter
Save Our Streams Coordinator
Izaak Walton League of America
1401 Wilson Boulevard, Level B
Arlington, VA 22209
(703) 528-1818

The Save Our Streams Kit costs $5

The following activities:

"Something's Fishy Here"
"Alice in Waterland"
"Deadly Waters"

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Project WILD Coordinator
6013 Lakeside Boulevard
Indianapolis, IN 46278

For further information on irrigation and global understanding, contact:

Juma Gul Bandawal
Office of School Assistance
Center for School Improvement and Performance
Indiana Department of Education
Room 229, State House
Indianapolis, IN 46204-2798
(317) 232-9141